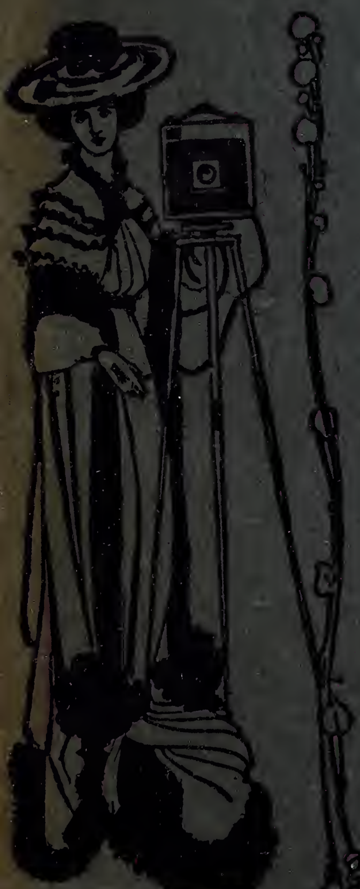
THE PRACTICAL PHOTOGRAPHER

(LIBRARY SERIES)

EDITED BY REV. F. C. LAMBERT, M.A.

NUMBER 28.



The Pictorial Work of
Charles H. L. Emanuel.

The Optical Lantern for Projection & Enlarging.

67 Illustrations and Diagrams.

PRICE 1/- NET.

January 1908.

HODDER AND STOUGHTON
27, PATERNOSTER ROW, E.C.

The Practical Photographer.

Library Series. **The Optical Lantern.** **No. 28.**

Principal Contents.

Illustrations.

Editorial and other Notes.

Our next number (ready February 1st, 1906), will deal with the important subject of **Telephotography** in an eminently simple and practical manner. Numerous comparative illustrations will be included.

This number will also contain several reproductions of the choice work of **Mr. A. H. Blake.**

Other numbers now in active preparation will deal with **Gas-light Papers. Chemistry for Photographers. Pinhole Photography. Curiosities of Photography. Oil Printing. Iron Printing. Ozotype. Stereoscopic Photography. Finishing the Print. Copying. Trichromatic Photography. Minor Printing Processes. Photogravure. Photo Ceramics. Photographic Societies, Meetings, Libraries, Exhibitions. Photography for the Press and Commercial Purposes. Microphotography. Pictorial Composition** (2nd part). **Portraiture** (2nd part), etc.

Deferred Print Criticisms.

Out of consideration to the many, we have hitherto deferred publishing criticisms of prize pictures until the prints and criticisms could appear together in the same number. But we have now devised a plan whereby the authors of the winning prints will receive privately an advance criticism. We hope to put this method into practice at once, and take the present opportunity of heartily thanking our numerous and esteemed prize winners for their greatly valued patience and good nature.

Criticism of Prints.

It is our desire to make the criticism of prints a special feature in our pages. The Editor gives his personal careful attention to this matter, and aims at making every criticism a practical, interesting, and instructive object-lesson. By paying attention to the hints thus given, often a poor print may be improved and a good print followed by one still better. In order to encourage readers to take great care in the preparation of the prints they send us, we offer **Fifteen Shillings in Prizes** for the best three, four, five, or six prints sent in each month. The winning prints will not be returned. (See Coupon).

General Notices.

1. It is particularly requested that any errors in the spelling of **Award Winners' names** should be notified to the Editor immediately they are observed.

2. Will contributors to our various competitions kindly refrain from sending *under one cover* prints for *different* competitions? This not only gives us considerable trouble, but involves the risk of the various pictures not being properly entered for the competition for which they are intended. It is far better for all concerned to send each lot of prints in separate parcels.

3. Will competitors please notice that the latest date for receiving prints for our competitions is that given on the coupon, and that we *cannot admit late arrivals?*

4. Will competitors please bear in mind (1) that the judging and criticism cannot be done until after the closing date of the competition. (2) that we go to press before the 25th of the month, and (3) that the criticism of a large number of prints takes considerable time?

5. In response to numerous requests from our correspondents we have pleasure to announce that we will do our best as far as space permits to reply to queries of a photographic nature. Will querists please (1) write plainly, (2) on one side of the paper, (3) as briefly as is consistent with clearness, and (4) give us the indulgence of their kind patience? (*Vide* Coupon).

This Coupon Expires January 31st, 1906.

THE PRACTICAL PHOTOGRAPHER. COUPON No. 68.

Prints for Criticism (or Queries).

RULES.

1. Write legibly, on one side of the paper only.
2. Put your name, address, and a number on the back of each print, and enclose this coupon.
3. Do not send more than three prints with one coupon.
4. State the *Month*, *Hour*, *Light*, *Plate Speed*, *Stop*, ☞ *Exposure*, *Developer*, *Printing and Toning* process employed.
5. If prints are to be returned, a stamped and addressed label or envelope *must* be sent **with the prints.**
6. The Editor reserves the right of reproducing any print sent in for criticism.
7. Prints should be addressed :—THE EDITOR OF *The Practical Photographer* (Print Criticism), 27, PATERNOSTER ROW, LONDON, E.C.

Print Criticism. Awards:

It is interesting to note that this month we have received more than the average number of prints and that some of these are submitted by workers who have not previously sent us any prints for criticism. Moreover, these new contributors, in several instances, send work of very great promise. The following are the awards for the month :—E. Goring, "The Cobbler"; Rev. R. W. Berry, "Aberglaslyn"; R. Marshall, "A Quiet Harbour"; B. Schon, "Winter in Cambridge"; Miss Chichester, "Bindweed"; J. R. Richardson, "A Shady Pathway." The following are also very highly commended :—G. Hildrey, O. Collier, A. G. Warren, A. S. Crossley, E. J. Brooking, C. Baxendall.

Erratum.

The Practical Photographer, No. 27, page 26, line 8. For "concave," read "convex."

Hand-Camera Competition Coupons.

(See next page).

P.P. COUPON 64 H.C. C. *Class*........... *Office No*.......................................	*P.P.* COUPON 65 H.C. C. *Class*.............. *Office No*.......................................
P.P. COUPON 66 H.C. C. *Class*........... *Office No*.......................................	*P.P.* COUPON 67 H.C. C. *Class*.............. *Office No*.......................................

N.B.—A similar block of four Coupons (Nos. 60—63) may be found in our last issue, page iv.

Hand-Camera Competitions.

Class A.—Landscape or seascape, with or without subordinate figures, cattle, etc.

Class B.—Portraits, groups, figures, street scenes, etc.

Class C.—Objects in rapid motion, *e.g.*, waves, trains, animals, sports, etc.

Class D.—Curiosities, rarities, burning buildings, train accidents, strange animals and plants, curious customs, etc.

Please read the following Rules and Instructions carefully before sending in Prints.

1. The negative from which the prints are made must have been exposed in a hand camera.
2. Prints may be by any printing process, and of any size (enlargements debarred).
3. Each print must be mounted and not more than one print placed on one mount.
4. Framed pictures are ineligible.
5. On the back of each mount must be legibly-written :—Name and address of competitor; title or description of picture; month, hour, light, plate or film, stop, and exposure; and the class in which it is desired to enter the print. This last-named detail is to be entered on the form provided for that purpose as explained in the next paragraph.
6. In this number of *The Practical Photographer*, will be found four small entry forms marked "*The Practical Photographer* Coupon, 64, 65, 66, 67." One of these is to be cut out and pasted or gummed to the back of each print. The space for the Class letters to be filled up by the competitor and the other space left blank for office use. Four similar coupons were published in our last issue.
7. Competitors may use all the eight coupons to enter eight prints in one one class, or distribute their coupons among the various classes as they please.

Awards.

8. Silver and Bronze Plaques and Certificates for each of the four classes will be placed at the disposal of the judges, who shall have liberty to withhold awards from any class wherein the prints are, in their opinion, of insufficient merit. Or they may transfer the awards from one class to another if the number or quality of the prints suggests this course.
9. Unsuccessful prints will be returned if a stamped and directed envelope is sent with the prints.
10. Prints winning plaques or certificates will not be returned; and the Editor reserves the right to publish any such winning prints, either in *The Practical Photographer*, or in the **Special Double Number** now in active preparation. This special number will be devoted to Hand-Camera matters, and be called "**The Hand-Camera Companion and Guide.**"
11. Prints for this competition must reach the Editorial Office not later than **February Ist, 1906,** and the package must be addressed as below :—

The Editor of *The Practical Photographer*
(Hand-Camera Competition),
Messrs. Hodder & Stoughton,
27, Paternoster Row, London, E.C.

N.B.—The Editor will be pleased to consider any short notes, hints, or suggestions calculated to make "**The Hand-Camera Companion**" as complete and comprehensive as possible. These should reach the Editor before the end of the present year.

Outdoor
dancing
Brittany.

THE PRACTICAL PHOTOGRAPHER.

Library Series. No. 28.

The Pictorial Work of Charles H. L. Emanuel.

By THE EDITOR.

MR. EMANUEL'S work at once strikes the observant student as having a well-marked character of its own. This is easily understood by those who have the privilege of his friendship, for they know that he has thought out his position for himself, and when need arises he can state his views modestly but firmly and unmistakably. In these present days of thoughtless imitation and "change for change's sake" it should serve a wholesome purpose now and again to pause and consider some of those opinions which such independent thinkers and workers have evolved for themselves. Therefore we shall take the liberty of quoting very freely from a greatly valued letter written by Mr. Emanuel to the present writer.

Mr. Emanuel's acquaintance with photography goes back about seventeen years or so, when he used a 5×4 camera with some curious sort of tank attachment for developing. "With this apparatus," he says, "I entirely failed to turn out any masterpieces." Next came a Vest detective camera, a round nickel-silver contrivance which was sportively used for pot-shotting the college Dons, a procedure which was not entirely appreciated by these depositories of learning. Then came an apparatus of a

more serious character, and a visit to the charming district of Concarneau in 1890, which "filled me with a fondness for photography which still lasts." Mr. Emanuel goes on to say: "It was on this trip that I got a grip of the rudiments of artistic photography, a brother (an artist) being of the greatest help to me. The first incentive to exhibit came from the Camera Club, two of my little Brittany notes being selected from one of the club exhibitions for publication in the *Pall Mall Budget*." Mr. Emanuel has been a yearly exhibitor at the Salon practically from its inception, and about ten years ago he accepted the valued invitation to become a member of the Linked Ring.

All his work is direct (*i.e.*, not enlarged), and seldom, if ever, larger than half-plate size. He holds the opinion that an enlargement is prone to alter the tone values of the original, and while an enlargement *may* yield a desirable effect, yet it is not the effect aimed at when the original negative was taken.

He has an abhorrence of "bald-headed" prints, and at the same time greatly misdoubts the artistic truth of printed-in skies, inasmuch as they nearly always are so obviously borrowed, and usually over-printed as well. Consequently his constant endeavour is to secure—by an accurately-adjusted exposure and co-ordinated development of an orthochromatic plate or film—a negative which will yield a landscape and skyscape in complete harmony with each other; and so he says, "On a cloudless day I put my camera away." He uses chiefly a half-plate camera without a tripod, and his favourite printing processes are platinotype and slow bromide papers, and for these he aims at a rather soft negative combining delicacy with a subtle range of tones.

His favourite subjects are those characterised by delicacy of atmospheric effects in conjunction with fine landscape. But his taste in art matters is so catholic (for he has half a dozen other artistic hobbies in addition to photography) that he derives pleasure from any and every aspect of nature's ever-changing face; and it is a continual regret that the many calls upon his time do not permit

of his using his camera except on such occasions as may be snatched for a brief holiday.

He does not profess to call himself anything except a realist, and modestly avows that his photographs are only intended as "transcripts from nature without any handwork or faking." But we venture the opinion that our readers will share with us the feeling that to these transcripts there is added a very attractive personal touch, betokening a keenly appreciative and refined taste. Our readers are therefore seeing "straight prints," and may from them learn the lesson that entirely charming results can be got in this way. He says: "I have not sufficient leisure to tamper either with the negative or the print, and, in my opinion, if handwork is admissible in photography it is only excusable when it is added so exquisitely that it is completely hidden and as completely deceives."

"I am hardly inclined to consider photography as one of the Fine Arts, but in the hands of a few it comes very close to being an art." Where it fails is in the limitations it places on the powers of selection. This limitation can only be removed or modified by handwork. If therefore it is an art, it is one which cannot stand by itself, but has to call in the aid of the draughtsman or painter. In some procedures—such, for instance, as in gum-bichromate printing, where brush development has special attractions—the result is what may be termed a hybrid, and owing a large, indeed perhaps its chief, charm to the draughtsman as apart from a purely photographic result.

"Those who practise pure photography are getting more and more at a disadvantage. Our exhibitions encourage novelty, and novelty in photography seems to imply the abandonment more and more of pure photography in favour of the hybrid productions of photography *plus* handwork. Such handwork *may* exclude objects which the camera insist on reproducing, and may introduce other objects or features which the camera cannot or did not produce. To the really artistic eye such hybrid productions are not successes. The honest photograph is not intended to be brought into com-

parison with the painter's art, but to stand by itself, While the hybrid productions invite such comparisons, with results almost invariably to the discredit of the painter-photographer. The best that can be said of the average faked photograph is that it is about as good as an inferior drawing of the same subject, whilst the personal interest which attaches to a drawing is almost entirely absent."

The above extracts and condensations are of such far-reaching importance and virile honesty that we have not been able to resist the temptation to give them at length.

Fig. 1. "**Out-door Dancing, Brittany.**"—It seems that on fête days the people of the Concarneau district come together from the neighbouring villages for miles around to enjoy their simple pleasures. Dancing in the sunlit, albeit dust-laden, streets by day and in the market hall by night is one of the pleasures of these grown-up child-like folk. Note the admirable suggestion of warm sunlight and the swinging rhythm of the dancing figures in their care-free gladsome holiday.

Fig. 2. "**Sardine Boats.**"—This and the Dancing Scene are reminiscences of the visit to the Concarneau district, which is the centre of the sardine industry. The cork-lined nets form a strong feature in the general decorative effect of the picture as a whole. It is a good example of a simple, but well balanced, composition.

Fig. 3. "**A Water-way in Ghent.**"—A visit to Belgium brought a good "bag" of negatives, of which we here have a typical result. The converging lines of the building to our right and left give us an excellent suggestion of distance, and the glistening sunlight here and there enforces the forms and keeps our attention well with the picture.

Fig. 4. "**Toil in Flanders.**"—A concentrated chapter on the rare value of simplicity of subject and design. Those of our student readers who have hitherto confused simplicity with emptiness may here find a valuable lesson, which shows that the two are not alike, and that usually the simplest compositions are fullest of interest.

Fig 2 (p. 4). C. H. L. Emanuel.

SARDINE BOATS.

A Water-way in Ghent.

Fig. 3 (p. 4).

C. H. L. Emanuel

Fig. 5. "**Where the Sea Encroaches.**"—A bit of a deserted East coast English village overwhelmed with shingle. Here, if we are fortunate in our reproduction, we shall see the loving care with which the natural cloudscape is retained in true harmony with the tones of the rest of the picture. In this composition one feels to need a little more concentration of interest in the land part of the picture.

Fig. 6. "**The House on the Wall.**" A quite charming and original picture, exemplifying the artist's nice appreciation of subtle gradations and delicacies of tone rendering. Some of this delicacy is inevitably lost in the half-tone process of reproduction, but we hope to retain enough of the original character to serve as a starting point for the imagination of our readers. The student will not fail to note that with the exception of the two grey boats all the rest of the picture is in the higher notes of the octave, and yet there is nothing blatant, nothing shrill, nothing but gentleness and refined delicacy. The subject is of itself not particularly engaging or romantic, but the treatment is entirely charming.

Fig. 7. "**On the Outskirts of Ostend.**"—Although Mr. Emanuel says he is only a realist, yet this picture conveys a remarkably complete impression, *i.e.*, as a whole, and no little measure of its effectiveness is due to the tender and sympathetic rendering of the sky and clouds in harmony with the rest of the scene bathed in a soft mellow light. Note how the small white house in the distance tells against the sky beyond.

We are well convinced that we are voicing the thoughts of all our readers in asking Mr. Emanuel to accept our very hearty thanks for his great kindness, not only in lending his pictures, but also in placing at our disposal some exceedingly interesting and suggestive jottings on art matters, from which we have helped ourselves.

It is seldom that among photographers one meets a man so modest and reticent as he is, and therefore we consider ourselves doubly fortunate in having induced him to open his mind and give us his own thoughts.

Easy Introduction to Lantern Optics.

WE shall assume that the reader possesses a camera of some kind, has used it to make some negatives and, possibly, a few lantern slides by contact printing, also that he has seen a "lantern show" of slides at some time, and is interested to know just enough about the optical side of "how it is done" without troubling to go into the minutiæ and technicalities of lantern work.

Possibly he may be contemplating the purchase of an inexpensive lantern for home use and is wondering if the same lantern could be used for enlarging and also a lantern-slide display on a small scale in the drawing room.

This combination of uses is quite possible and practical. But, of course, he must understand that a lantern especially designed for one of these purposes is not equally well adapted to the other use. Still, if he will be content to show his slides on a modest-sized sheet—and there is a *great deal* to be said in favour of such small sizes—he will find his enlarging lantern do all he wants as a projection instrument.

So far as we are concerned for the moment, the consideration of the optics of the matter is practically the same for enlarging or projection.

A few simple experiments will give the reader a better "grip" of the subject than many pages of easy-chair reading, and we strongly advise him to follow us in these experiments :—

1. Remove the lid of an empty packing case of roomy size. Set it on its side on a table so that its open top is now an open side and the top no longer open (fig. 21). In this box (our extemporised lantern body) put a lighted lamp or candle. Take the whole arrangement into a darkened room, or one where the blinds are down and curtains drawn. As we

turn the box with its open side this way and that, we notice a considerable difference in brightness between the objects we know to be light and others dark when seen in daylight. Suppose that our box faces a dark curtain and a light-coloured wall. Hold the hand midway between the lamp and wall. Notice that we see little or no shadow cast by the hand on the dark curtain, but that a shadow is seen by force of contrast on the light wall. The strength of shadow depends on the lightness or darkness of the background on which it falls.

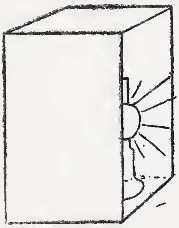


Fig. 21,

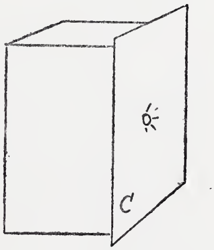


Fig. 22.

2. Now hang up against a wall (or fix with drawing pins to the door) a smooth white sheet, table cloth, or large piece of white card or paper. Now on this with the spread-out fingers cast a shadow, and notice that the smaller the shadow the sharper its outline. Try holding a somewhat thin lantern slide or negative two or three inches away from a sheet of white notepaper. The fine details of the subject are already lost in the shadow, and the light hardly gets through the darker parts of the slide or negative at all. We therefore want more light and sharper detail effect. Take a sheet of card C or stiff brown paper a little larger than the open side of the packing case, and just on a level with the lamp flame make a small hole in the card about the size of a threepenny piece. Bring the lamp close up to this opening. Repeat the experiment of casting a shadow on the sheet with the fingers. With the smaller source of light (fig. 22) we get a sharper outline to our cast shadows. If a lantern slide is held about an inch or so from a piece of white card we shall be able to see the

larger forms of the shadow image. By reducing the *size* of the source of light we have sharpened the edges of the shadows, *but* we have considerably reduced the quantity of light, *i.e.*, reduced brightness and contrast. We may therefore conclude that direct cast shadows are quite out of the question either for enlarging or projection of slides.

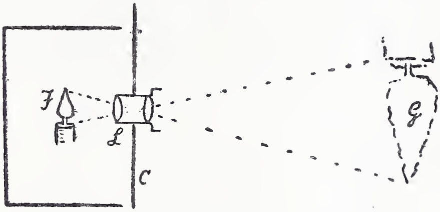


Fig. 23.

Fig. 24.

3. Let us now replace our lamp in the box by a lighted candle, and let us also enlarge the hole in the card C until it will hold L, the lens temporarily removed from our ordinary camera (fig. 23). By a little manœuvring of positions we can *project* on our white sheet an image G of the small candle flame F. We notice three things: our image is—*enlarged, inverted* and *enfeebled* in luminosity. Of course by replacing the feeble candle flame F by some stronger light, *e.g.*, gas, electric arc, etc., we could get a brighter image.

4. We may now re-place our stronger illuminant, *viz.*, the lamp in our box, and can imagine for the moment that it is a sufficiently strong source of light. Now take a wide-mouth bottle, fitted with a cork. In this cut a slit, and with the aid of three pins fix up a positive (slide) or a negative as indicated in fig. 24, and with the help of a block of wood, C, bring the centre of the slide opposite the centre of the lens, and examine the result on the screen SS, fig. 25. We shall find that we can get a fairly bright and sharp image corresponding to a quite small part of our slide. This is the part which is in a straight line with the centre or axis of the lens, but the corners of our slide are hardly seen at all on the screen. If we remove the lens L for a moment and look at the slide with the lamp behind it, moving our point of view here and there, we shall find that the lamp is sending approximately

Fig. 4 (p. 4). C. H. L. Emanuel.

Toil in Flanders.

Fig. 5 (p. 5). C. H. L. Emanuel.

Where the Sea Encroaches.

the same amount of light through all parts of it. We can realise this by holding a piece of white card the same size as the lantern slide on the further side of the lamp, and about as far from the lamp as

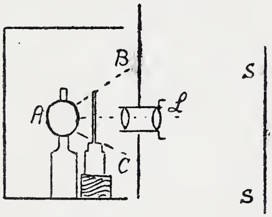


Fig. 25.

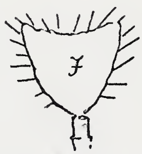


Fig. 26

the slide is. We therefore infer that while the lamp is sending an even illumination through all parts of our slide, yet the lens is not benefiting by it. But a glance at the figure shows us that such rays of light as AB, AC, while passing through the slide, do not go through the lens. Our every-day knowledge of such a source of light as a flame (fig. 26) tells us that it gives off light in all directions.

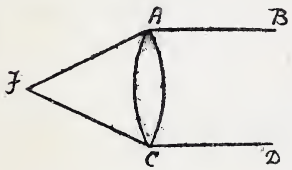


Fig. 27.

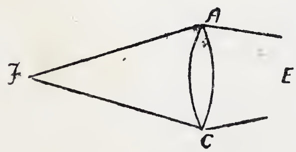


Fig. 29.

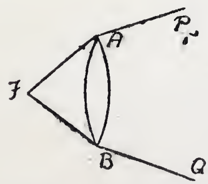


Fig. 28.

5. Now let us take any convex lens, such as a good sized hand reading glass set in a rim, and with a handle; or we may use either half of a symmetrical doublet camera lens if it is of fairly large size. Return to the arrangement shown in fig. 22, where we have a (comparatively) small source of light. Holding the lens in the left hand and a piece of card in the right find such a position of lens and card, so that when the lens is held still and the card moved towards and away from the lens the circle of light on the card remains the same size

(and practically the same degree of brightness). This is indicated by fig. 27, where F is the small source of light and AB, CD, the bounding or marginal emergent parallel rays. Now move the lens a *little* nearer the light (fig. 28) and notice that as the card is moved from the lens the circle of light gets larger, and that it gets smaller as the card is brought nearer the lens. Now bring the lens into its first position, as in fig. 27, and then move it a *little* further away from the light, fig. 29. Now observe that the disc of light on the card gets smaller as the card is moved away from the lens. We therefore conclude that the lens in this position causes the diverging rays FA, FC, to converge again towards E. Now this is precisely what we want to do with the diverging rays AB, AC, in fig. 25, *i.e.*, we want to bend them so that they will pass through the lens L, and this we do in the ordinary optical lantern by placing such a convex lens (or lenses) between the illuminant and slide (or negative, if enlarging).

A glance at figs. 30 and 31 will show us what a difference this converging lens (or condenser, as it is usually called) can make.

In Fig. 30 we see that the only light which passes through our slide and enters the projecting lens L, is that between the marginal rays FA and FB. This only concerns a small and central part of the slide (or negative). Such rays as FC, FD, which pass through the marginal parts of the slide are lost, so far as the lens L is concerned. But by putting a converging lens PQ just in front of the slide CD fig. 31, the rays which, without it, would have gone forward in the direction of the dotted

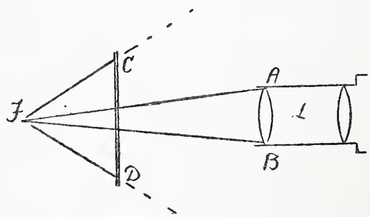


Fig. 30.

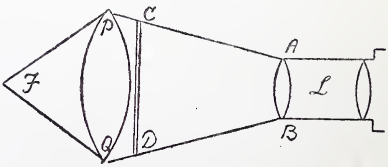


Fig. 31.

line, are now bent along CA, DB, and made to converge towards and enter the lens L. So that we can get all parts of our slide projected on the screen. It will now appear that this condensing lens must be large enough to cover the slide right up to the corners of the picture. Otherwise, the rays passing through the uncovered parts will not be sent through the projecting lens.

For various reasons which we need not now pause to discuss, it is in practice preferable and customary to use two plano-convex lenses instead of one bi-convex lens, but in general effect the result is the same. In fact, we may imagine our bi-convex lens MN, fig. 32, cut in half, giving us two plano-convex lenses P, Q, and then their positions interchanged so that the curved (convex) surfaces are facing, and close to each other.

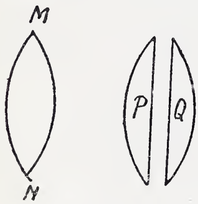


Fig. 32.

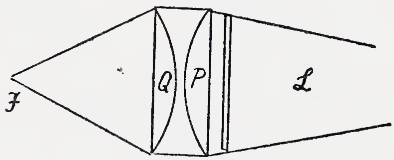


Fig. 33.

The general effect of this condenser system as it is often called, is roughly indicated in fig. 33. F is the illuminant, Q, P the two lenses of the condenser.

The wide-awake reader will very probably and correctly argue that a third converging lens R, placed between F and Q, would converge a still greater cone of light, and so give a brighter picture. This has been done, but there are difficulties of construction, danger of breakage by heat, and increased cost to consider, so such triple lens condensers are not often met with (fig. 34). If the lantern be in use for enlarging; the extra light only means a slight shortening of the exposure, and this is not often a very important matter: if for projection, and the picture is not as bright as desired, then we may use some other illuminant, or be content with a smaller size of picture.

So far we have chiefly concerned ourselves with the question of illuminating the negative in such a way that our projection lens will give us an enlarged and fairly evenly lighted image on the screen.

We may now turn our thoughts to an ordinary camera, and imagine that we are photographing some well lighted and not very large object close at hand, such, for instance, as a vase of flowers, or a black and white engraving. We may be making a negative of the flowers life size or even a little larger than life size. And we may now compare this state of affairs with the projection of an image by means of a lantern.

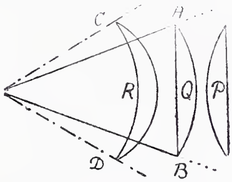


Fig. 34.

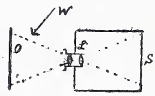


Fig. 35

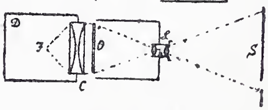


Fig. 36.

Fig. 35. Light from a window W falls *on* the object O (the flowers, engraving, etc.), and L, the lens, forms an image at S on the ground-glass focussing screen.

Fig. 36. Light from F, the illuminant, is made to pass *through* O, the object (a lantern slide or negative), by means of the condenser C, and onward to the lens L, which again forms an object on S, the projection screen, which will be opaque if the audience are on the lantern side of it, or semi-transparent (*e.g.*, a wetted sheet) if the audience are on the opposite side. In the first case (fig. 35) the camera is so placed as to shield the focussing screen (or sensitive plate) from all light that does not pass through the lens, L. In the second case (fig. 36) the camera is turned the other way round so as to protect the projection screen from light which has not passed through the lens L.

Thus the reader is brought into touch with his previously acquired knowledge of photographic optics acquired during the ordinary practice of negative making. He already knows that for each

Fig. 6 (p. 5). C. H. L. Emanuel.

The House on the Wall.

ON THE
OUTSKIRTS
OF
OSTEND.

Fig. 7 (p. 5).

C. H. L. Emanuel.

distance between the lens L, and object O (fig. 35), there is a corresponding or *conjugate* distance between the lens and focussing screen. If one of these is increased the other is diminished, and *vice versa.*

The same thing holds good in fig. 36. If the distance between O and L is diminished we must increase the distance between L and S, and this gives a picture on the screen on a larger scale, but with a reduced degree of light and shade, as the same quantity of light is now spread over a larger area.

But now crops up a matter of great practical importance both to the enlarger and the slide showman. If the projection lens occupies such a position as L in fig. 37, well and good. For the whole of the cone of light from the condenser has entered L, and our picture is as bright as we can under these conditions get it. But suppose for some reason (the dimensions of the room, size of sheet, rack length of enlarging camera, etc.) that our lens is at M or at N. Then obviously we are not using the same quantity of light that we did when the lens was at L. For if it is at M or N the marginal rays are lost, and consequently there must be a falling off in the margins of our picture, as very little of the light coming through the outer parts (margins) of our slide is passing through the projecting lens at M or at N.

Fig. 37.

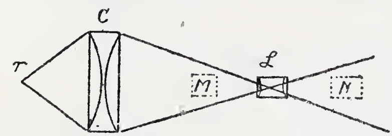


Fig. 38.

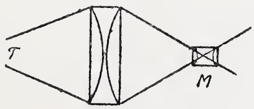


Fig. 39.

If the lens is at M or N we must so rearrange matters that the apex of the cone of light shall fall within the lens just as it did at L, fig. 37. If now we remember that our condenser pair of lenses PQ, fig. 32, is only a biconvex lens cut in half and

turned inside out as it were, it will at once occur to the reader that it will have pairs of conjugate focal distances just like any other convex lens (or positive lens system). Therefore to bring the apex of the cone to M, fig. 38, we must increase the distance between the condenser and the illuminant; or if the projection lens is at N, fig. 39, we must bring the illuminant closer to the condenser.

Now a glance at figs. 40 and 41 will show us that the nearer the source of light is to the condenser the wider cone of light it gathers up and sends through the slide.

Suppose the angle AFB to be the same in both figures, so that the light falling within FA, FB fig. 40, would fill the space AB if not intercepted. Now suppose F to be put twice as far from the condenser surface CD (fig. 41) as F is from AB (fig. 40). Then AB is twice as long as CD (fig. 40) and the base area of the cone AFB is twice as wide and twice as high as the base area of the cone CD. So that the condenser surface CD, fig. 41, is only receiving one-fourth the light which falls on AB, fig. 40.

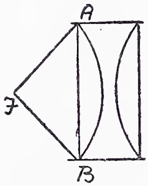


Fig. 40.

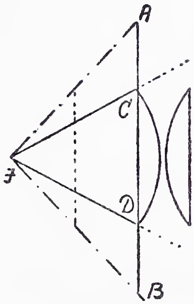


Fig. 41.

However, we must set against the gain of light due to approximating the illuminant to the condenser surface several drawbacks, *e.g.*, the increased danger of the heat cracking the condenser, the inequality of light falling on the different parts of the condenser surface due to their varying distances and varying angles, the varying degrees of loss of light due to reflection at different angles, the increased error due to spherical aberration, etc., all these telling against the nearer position of the illuminant.

In practice, therefore, it is found best not to bring the illuminant too near the condenser, but to accept

a convenient compromise which takes into consideration several factors, among these being the equivalent focal length of the objective. And to this part of the apparatus we must now turn.

Our previous experience with the camera in the field will have taught us that the further away the object the nearer the focussing screen was to the lens. When the objects are, let us say three or four hundred yards away, and we get them in sharp focus, we observe that all still more distant objects are also in much about the same degree of sharpness. We may then regard the distance between the focussing screen and lens stop, as (roughly) the equivalent focal length of the lens in use. If we bring the focussing screen and lens nearer together than this we cannot get a sharp picture of objects at any distance at all.

Applying this to fig. 36, we see that if the distance between the slide O, and lens L, is equivalent to that when photographing objects at a distance, then our projection screen S must be an impracticably long distance away, and of equally impracticable size. Therefore, for practical enlarging or projection the distance between O and L must be appreciably greater than the equivalent focal length of the lens in use. We thus get this nearer limit of distance between O and L. This in turn fixes for us the practical limit of the distance between the illuminant and condenser. See figs. 37, 38, 39.

It will now become clear that the distance between the objective L and object O (slide or negative) is determined by the equivalent focal length of the objective and the size of the projected image relative to the size of the object. Next observe that the size of the cone angle thrown into the lens L (fig. 37) depends upon the distance between O and L and the size of O.

Again, the relative position, or distance between the condenser C, illuminant F, depends upon the equivalent focal length of the condenser lens (or lenses) when the distance between L and O has been predetermined.

Hence, when the cone angle of light entering the objective has been determined, nothing is gained

by using a size of stop opening any larger than that just sufficient to admit the entering cone.

The Objective.—Very broadly speaking, *any* positive lens, such as a simple lens like a reading glass, a single landscape lens, a rectilinear doublet, or a portrait lens *may* be used as a lantern objective for projecting an enlarged image on to the viewing screen. But in practice it is desirable to have a lens passing the maximum quantity of light, and also possessing a flat field. Now the quantity of light, other things being equal, depends on the stop opening compared with the equivalent focal length. In other words, light efficiency is closely comparable to rapidity in the photographic sense. We find the highest speed among portrait lenses or the anastigmatics of quite modern manufacture.

Flatness of Field can best be exemplified by the following simple and useful experiment:—Between two clean and dry lantern slide cover-glasses lay a piece of fine net, such as is used by ladies for veils, or very thin canvas (the net is far better). This net may advantageously have been ironed to take out creases and get it quite flat. Now trim the net to the exact size of the glasses ($3\frac{1}{4} \times 3\frac{1}{4}$) and then bind up in the usual way. Insert this net slide in the usual carrier and focus the image as sharply as possible on the screen, but only paying attention to the centre of the slide. If the lens has not got a flat field then, when the centre of the slide is in sharp focus, the corners are not so sharp, and if the position of the lens is altered to get the corners sharp, then the centre will be put slightly out of focus. This may be made clearer by a glance at fig. 42. If A, the centre of the slide, is in sharp focus at C on the screen, the corner B

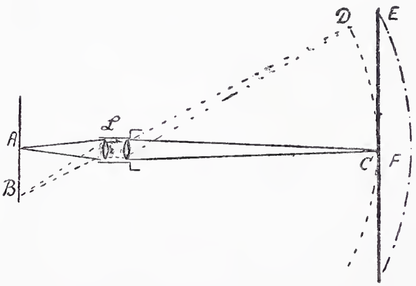


Fig. 42.

of the slide will be in focus at some such point as D, in front of the slide; and if the position of the lens be readjusted to bring D on to the screen at E, then the image of the centre of the slide, instead of being at C, will be at some such point as F, behind the screen.

Brightness.—As above said, there is no gain by using a stop opening larger than that just necessary to admit the entering cone of light from the condenser, but any stop smaller than this means a loss of light. Hence it follows that the use of a long-focus objective, *i.e.*, increased distance between objective and slide, means a narrower angle, and so loss of light.

Achromatism.—For projection purposes neither the condenser nor objective need be achromatic, but the presence of visible colour fringes will certainly detract something from the good appearance of the screen pictures.

In the case of the enlarging lantern it is important that the objective be achromatic, for it is quite possible with an uncorrected objective to get a sharp picture on the screen and yet the enlargement on development may be anything but sharp. (The reader may advantageously refer to the subject of Achromatism in our last number, *viz.*, *The Practical Photographer* 27.)

Focal Length of the Objective.—Probably the reader is in possession of more than one lens for use with his ordinary camera, and so knows from experience that from the same camera position he can get different sizes of image with lenses of different focal length. In the same way, by using objectives of different focal lengths, we can project our lantern slide to different degrees of enlargement on the screen without changing the position of the lantern or screen. For the lanternist who may have to operate in rooms of various dimensions, it may be a convenience to have two or even three objectives of different focal length. But the ordinary worker who operates chiefly for his photographic society or a family gathering at home, will find an equivalent focal length of something between 5 and 10 inches generally convenient and sufficient.

The Size of the Screen Picture.—The beginner should familiarise himself with the accompanying diagram and the following very simple method of roughly estimating the size of the picture on the screen with any objective and at any distance from the screen, so that he may know where to put up the lantern in order to get the size of picture required, etc.

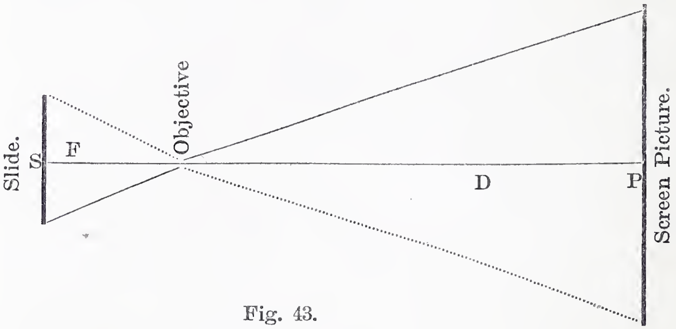


Fig. 43.

Observe that the pair of triangles with their points or apices meeting at the objective have for their bases the slide S and the screen picture P. Now the sides of these two triangles are proportional. That is to say the base S is to the base P as the distance F between slide and objective is to the distance P between picture and objective. So that by a simple rule of three, if we know any three of the four quantities S, F, P, D, we can instantly find the fourth one. Again we may reckon that the distance between objective and slide is (for slide projection, but not enlarging) only a trifle longer than the focal length of the objective and so we may usually reckon it as the focal length.

Suppose our slide S is 3 inches diameter, focal length of lens is 9 inches, and a 6 feet picture P is required. Then we state our proportion thus: $S : F = P : D$ (required).
(Now if we always keep S and F in inches and P and D always in feet we shall save ourselves a little multiplying and dividing). Then our rule of three is: $3 : 9 : : 6 : 18$ (feet).
Then 18 feet is the distance between lens and screen.

Again if using an 8 inch objective, a 3 inch slide, what is the largest picture we can get at 20 feet from the screen? Here we put our proportions: $F : S = D : P$ or $8 : 3 : : 20 : 7\frac{1}{2}$ (feet).

Once again. A 4 feet picture is required in a drawing room 16 feet long. What is the focus of the lens in conjunction with a 3 inch slide? Here we state the proportions:

$P : D : = S : F$, or in our case $4 : 16 : : 3 : 12$ (inches).

Fig. 8 (p. 62). O. W. F. Thomas

WHITE CURRANTS.

Fig. 9 (p. 62). A. Richards.

The
Finishing
Touches.

How to Select and Use a Lantern.

By CHARLES D. BISHOP.

SUPPOSING the reader has a £5 note which he wishes to exchange for a lantern, how can he do so to the best advantage?

First he must settle upon the purpose for which he will chiefly use his lantern, whether for the projection of slides, or for physical experiment. If purchasing for the latter purpose, £5 will not entirely cover the total expense, but if for the use of slides (either of home make or those produced by the professional slide maker) a good choice can be made. Some care in selection is necessary, as the means of illumination at the present day are somewhat numerous, lenses and condensers vary considerably, and even the lantern body itself has many varieties of design and pattern.

The Lantern is an optical instrument, and as such, should be the product of the optician as well as the metal-worker. A condenser, lens, and illuminant, put into a metal body does not necessarily constitute the perfect lantern.

The Nature of the Illuminant governs the choice of a suitable condenser to act with it to its best advantage, as does also the size of the masks of the slide. This we will refer to later.

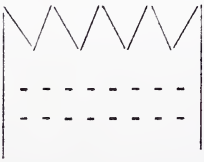
The Front Objective also needs care of selection for its particular purpose, and should be suited to the illuminant.

Considering the Illuminant First, as the prime source of attention, we have a choice of oil, acetylene, incandescent gas mantle, and electricity.

The most popular source of illumination undoubtedly is oil, and in the choice of an oil lantern is where the uninitiated will find the greatest trouble, as the makes are so varied, the results so disappointing, and the seller's blandishments so gilded,

that the purchaser is almost forced in despair to take the first lantern offered.

The majority of commercial oil-lighted lanterns offered by the dealers differ materially but little, are crude in workmanship, and disappointing after a time, the reason being that they are too often made to sell, and not for use. The illuminant may be a 3 or 4-wick paraffin lamp, but the number of wicks and the candle power of such lamps count for little; what we have to consider is the light they will give upon the screen. A good 4-wick lamp, with wicks of 2 in. diameter, is the handiest and cheapest source of illuminant. The points to look for are as follows: the flames must be concentrated to form a point, as near as we can get it; there must, above all things, be perfect combustion if we want freedom from odour, which also means the remotest possibility of smoking. A lamp having glasses that crack with heat should be avoided. Avoid mica as a substitute for glass, as it reduces and yellows the light. Do not choose a lamp with an elongated hood, and the glasses placed at each end: the glasses are so placed to lessen the probability of fracture from heat, and a perfect draught for combustion cannot be obtained with a hood so placed. The colour of the light is a consideration; a yellow flame will show a yellow picture. A flat even burning flame is not what we want, but a rugged intensely white flame which burns plenty of oxygen, remembering that only a portion of the flame is of avail for optical purposes, the rugged top and the blue at the bottom by the wick tubes are not used at all, but only the centre portion, *i.e.*, about half an inch in all.



A lamp that is supposed to burn in a crowded room is not the best lamp, as fresh air for a lamp is a *sine qua non*, for perfect combustion cannot be obtained without it. No manipulation or lengthening of a hot chimney can compensate for the lack of oxygen.

W-shaped wicks give less light than wicks placed parallel, for the reason that the flame can never be

a concentrated one. The pinions of the lamp wicks are best when turning all one way; when some turn to the right and other to the left it is necessary to think which is the right way, and during this time the flame may be smoking.

The Reflector plays a part in helping to increase the illumination of the screen, but unless it is of the proper focus it is of little use, and, in fact, the majority of reflectors aid but little in the illumination, being so badly adapted to their purpose. The centre should not be cut away for a sight-hole, nor should the reflector be made to do duty for a back glass, as the heat and oil products soon tarnish it, and it cannot easily be renewed.

Condensers.—For an oil light, a short-focus double plano-convex is preferable to any other pattern, and will pass most light. If the slides are masked with a cushion-shape mask, a 4 in. condenser is sufficient, and should be of short focus, as it passes more light than a larger size, which necessarily means that it must be of a longer focus. If the diagonal of a mask opening is less than 4 in., choose the smaller size, if the slide is unmasked and the measurement from corner to corner (measured diagonally) is more than 4 in. a 4½ in. is preferable; unmasked slides with a 4 in. condenser will have the corners cut off, or in photographic terms, it will not be covered. A meniscus form of condenser is usually of longer focus, and owing to the outer edge being nearer the illuminant, is more liable to crack from heat. There is a great deal of nonsense at the present time written about condensers not cracking with the heat; the glass has yet to be made for condensers or lenses, that will not crack with heat. It all depends upon what the heat is. A condenser placed outside the lantern body with a good opening in its cell for the air to get across will reduce the risk of fracture from heat. The general cause of a cracked condenser is unequal heating, or too rapid cooling.

The centre of the lens is thick, and the edge thin; if contraction takes place too quickly (in cooling off the lantern) or a draught of cold air from an open door is allowed to play on the lantern the condenser

contracts in the thin portion quicker than in the centre or thick portion, it may possibly crack without being noticed.

The Front Lens or Objective—This is almost universally of the Petzval form, composed of a crown and flint combination cemented in the front and a double convex crown and meniscus flint in the back with a space between; this combination does not need a stop of any kind, and consequently passes a great deal more light than any other form of lens yet made for projection, or in fact any other purpose. Anastigmatic lenses are unsuited, no matter of what superior formation or make.

The front combination can be used alone if a long focus lens is required, but of course there is a loss of light.

If the lantern is for use in a room of 20 feet in length or less, a 6 in. equivalent focus is best, and with a 3 in. opening in the slide, will give a picture half the size of the distance at which the screen is placed from the lantern, *i.e.*, lantern placed at 20 feet, gives a 10 feet picture.

If the equivalent focus gets beyond 6 in., the light begins to suffer, and to compensate for this a larger diameter is necessary, *e.g.*, not less than $2\frac{3}{8}$ inches. For a short-focus lens a 2 in. diameter is large enough; if a larger diameter be used the definition will suffer, as the curves are too deep, and colour fringes to the picture will result.

If the opening of the slide is more than 3 inches, choose for preference a long-focus lens, the short-focus will not cover a $4\frac{1}{2}$ in. condenser properly; a lens of 7 or 8 in. equivalent focus is the best in many ways; the definition is better, and a longer focus condenser (as in the $4\frac{1}{2}$ in.) may be used.

The Lantern Body.—This may be of japanned tin or Russian iron. If elegance is a consideration it may be of polished mahogany, with an inner lantern to prevent the wood getting unduly heated. The slide stage or front is nicest when made of brass, and of the open stage type, allowing the carrier to be put in from the top, and clamped up with an archimedian screw holding the carrier firmly; also opening wide enough for a tank or very thick frame.

Plenty of ventilation for an oil light is absolutely necessary ; for stronger illuminants less open spaces are necessary, or the light will stream out iuto the room, making it very uncomfortable for those sitting immediately behind the lantern, as well as spoiling the effect on the screen, because the room must be absolutely dark.

Incandescent Mantle Illuminants.—This is very convenient, clean, and soon got ready. But on the whole it is very disappointing as a means of illumination for lantern work, for the ordinary house pressure is not sufficient to give enough power; but when used under pressure, or when methylated spirit is burnt under pressure on a mantle, a forced draught is created, and a much superior result is obtained than when used with the ordinary house gas. Even then its result is not superior to the best oil lamp. The points in its favour are cleanliness (because if the spirit is spilled it will evaporate) and freedom from smell. If a spirit lamp is selected, be sure it is a good one that will not allow more spirit to pass than is consumed. There are many on the market that are to be avoided, as they either do not give sufficient force of spirit gas, or the methylated spirit leaks and drops into the lantern when alight, and is liable to become a source of danger. Do not forget that only about half an inch of the mantle is used for projection, the remainder is lost. The back of the mantle is of no use in our case, the larger the source of light the more it blurs the definition. In other words use a small mantle and cut off all the periphery rays beyond the very centre of the condenser.

Acetylene.—Generators for this purpose are legion, and the jets are numerous. There are three methods only of generating the gas called acetylene from calcium carbide. At the present time there are a great many lanterns lighted with this gas, for the reasons that the light is whiter, and the best forms will give three times the amount of light that the best oil-lighted lantern will yield. Jets for this gas are made with one to four burners, burning on an average one foot per hour per burner. If we could get all the light we require from one burner this would be an ideal illuminant.

When more than one burner is used it is customary to place them one behind the other, and thus varying focii are obtained, consequently definition suffers on the screen, for it is impossible to get the best definition from four different points (*i.e.*, when a four burner jet is used). Therefore, do not blame the lens if you cannot get a map or plan in focus from centre to edge.

Generators for the Manufacture of Acetylene Gas. Of the safety of the majority of generators at the present day we are pretty well assured: the experimental and elementary stage has long passed.

Choose one of the three methods of generating the gas, and learn the generator's whims and weak points, so as to know what to avoid. If you choose a tank generator which periodically makes the gas and stores it in its holder, be sure to choose one large enough for the longest exhibition you are likely to give. Generally the maker or dealer's lists gives the period of supply. Generators are made so that a specific period can be covered, and yet not use all the carbide. For instance, a generator for two hours can be divided up into four sections of 30 minutes each, which means we can stop when we like, within reasonable bounds, and later use the unconsumed carbide. In this form the carbide is stored up into four different cells, lasting 30 minutes each. When one cell is used we go on with the second, and so on. These, of course, are somewhat complicated in construction. There are others that are under control within reasonable limits. If we put sufficient calcium carbide in for one and a half hours, and expect to stop at the end of one hour, when the whole mass of carbide is somewhat damp, it is only natural that it will take a little time to burn out. If immediate cessation of the gas is necessary, put the tubing from the source of supply of the generator just outside the window, and let the gas blow away, or let it pass harmlessly up the chimney.

The Ideal Method is to have a generator that is not a gas holder, but only makes the gas as it is consumed, or by its own generator controls the water that gains access to the carbide. This

Fig. 10 (p. 62). A. Turner.

DECEMBER
IN THE
WOODS.

A SISTER OF MERCY

Fig. 11 (p. 62). T. Bryans.

principle is in use; the generator is not a storage tank or gas holder, and it may be knocked over without any fear of an accident from either the gas or water escaping. These forms also have the advantage of portability, and fewer parts to clean out after the show. The points to look to in this form of generator are the sufficiency of the water supply to keep the generation of the gas cool, and the need for care to keep the generator lower than the jet, or condensation of water will take place in the tubes, which will cause the flame to dance. With these points considered, the portable generator has much in its favour, with one exception; you are like the boy in front of the mad bull, "you can't stop when you like."

Generator and Jet Combined.—This combination looks simple, and is sometimes very satisfactory, especially if only one burner is used, but it will not stand 4 burners at one time, if used continuously, say, for two hours; the gas will be given off hot, and a great deal of tarry product is carried into the tubes and burners of the jet. This is, of course, because the gas is not given off in a cold state. With all forms of generators for the making of acetylene gas, the more gas generated, the more water is consumed and the greater the quantity required to cool it. If the gas is given off too damp a purifier or chamber packed with a suitable material will dry it, and save smoky nipples, and also prevent any chance of condensation of moisture and the formation of tar in the tubes.

Electric Light.—If the current is laid on "Eureka"! A few feet of flexible wire with a plug attached, to fit in the place of the ordinary electric glow lamp is all that is required, and we obtain one of the nicest forms of illuminants at the present day. Lamps are made to burn the Nernst filaments for lantern work. The filament consists of a single bar about an inch long; the construction of this filament does not concern us in this book, suffice to say that when this bar is heated with a spirit lamp or any other heater, it will pass the current and a brilliant strip of illumination is given forth of from 90 to 300 candle power, according to the voltage given by

the electric station. This lamp can be supplied complete for use for a sovereign, and a burner for a three filament lamp is also made giving as much as 900 candle power. All that is required to be known when using this form of illumination, is the voltage of the electric system, this is generally marked on the ordinary glow lamp, say 110, 140 or 240; a filament for the Nernst burner, must be used to suit this voltage. In fixing up for the first time note the poles of the wire either + or −, and always keep them the same, or the lamp will soon lose power, if first used on one pole and then on the other. Pole-finding paper and instruments are easily obtained. If always used off the same place there is no need to notice the poles, but put the plug in the same position each time of using. In fixing up the lantern for the first time, remove the ordinary glow lamp and fix in its place the plug with wire attached, this in turn going to the burner in the lantern; switch on the current, then with a methylated spirit heater or lamp, heat up the filament of the burner, which when sufficiently warm will burst into a brilliant glow of light varying in candle power according to the voltage and power of the lamp, the lamp has now to be centred in the middle of the condenser in much the same manner as a limelight jet, moving it up and down, from left to right, and in and out, watching the screen the whole time, until the disc is perfectly clear and evenly lit.

What is best to choose if £3 is the limit of the amount to be given for a lantern.

For the above amount (£3) we are confined to an oil, incandescent gas, or a one or two burner acetylene.

In the average room a picture of four to six feet will suffice, remembering always that the smaller the picture, the brighter it will be on the screen. A large piece of cardboard, or cartridge paper, makes an excellent screen in a room, failing that a small union screen, hung on the curtains or elsewhere, is much preferable to the ordinary bed sheet. Unless the sheet is absolutely white (a thing impossible with a washed sheet) light is lost in

reflection. New union has a bleaching and stiffness in it which is most desirable for lantern projection.

A very good oil lantern can now be obtained for the sum of money just mentioned if we look for the right lamp. Upon the lamp we rely for the light, and unless we get a white light our pictures appear with a yellowish tint. One of the advantages of an incandescent mantle is that the whiteness of the light is superior to oil light, although it lacks penetrating power to get through the darker parts of the slides. If there is trouble with broken lamp glasses in the oil lamp, a very thin sheet of mica can be obtained, and should be renewed frequently, as it rapidly assumes a yellowish tint from the smoke and products of combustion in the lamp. Do not attempt to improve the light by adding camphor, or hardening the wicks by soaking in vinegar. These two recommendations, often seen in text books, are quite misleading, as they do no good but a great deal of harm; the first clogs up the meshes of the wicks, preventing the necessary capillary attraction, and the second only hardens the wicks, and in another way causes the same trouble.

Should an incandescent mantle be chosen as illuminant, a lantern with a flat cowl and tray, as used in limelight, will be necessary; also a jet on which to put the incandescent burner. A burner such as is used in ordinary rooms can be used, taking care that there is a good supply of gas, so as to get the best out of the mantle. If a special lantern burner is used, let it be a small one, or Gem, remembering the more light we can concentrate into a small space the better. Many lanternists do not use a glass, but I think that the draught increased by the chimney adds to the whiteness of the light, of course, by so doing we increase the risk of the mantle breaking, because if the glass breaks the mantle is sure to get injured. With some of the Jena glasses now made the risk is small. This form of illuminant needs centring on the condenser, similarly to a limelight jet, the burner has to be moved up and down on the rod, also turned from left to right, and thirdly, to or from the condenser, until the disc on the screen is without any colour or shadow. The ordinary

distance of the light from the condenser is 2 inches, but as the size of the disc decreases, it may be as far away as 3 inches. This applies to all forms of illuminant.

Acetylene Lamp.—A "one-foot" acetylene burner will give an excellent light, sufficient for an ordinary room, a lamp and generator combined may be selected for one burner, as there is not much heat or consumption of water in generating a small quantity of gas. Beyond one burner it is advisable to have a separate generator; portable and cheap forms are now made for this purpose, which are reliable and clean, and without any chance of escaping gas. This is a consideration, as the slighest leakage of gas in a small room is objectionable. Remember that all generators must be kept at a lower level than the burner, or condensed water will form in the tubing. Use only good tubing, and so avoid all chance of any of the gas getting through, and lastly, renew the nipples of the jet frequently. A nipple once carbonised cannot be trusted again; a little mound of carbon will form, and smoke, not light, will be the result.

The Projection Lantern as an Enlarger.

By J. H. CRABTREE.

WHAT Negatives can be Treated?—The projection lantern can be used very effectively for enlarging purposes. I have used mine repeatedly in preference to my ordinary enlarging lantern. I find the optical lantern, having four wicks arranged like a W, gives a much better light than the enlarging lantern with its two wicks arranged parallel and one behind the other. The projection lantern gives a beautifully flat field.

It is applicable to any negative which can be inserted in the lantern stage, but, of course, will enlarge only a space about three inches in diameter. It is consequently well suited to small negatives.

In the case of larger negatives I have selected those parts which lend themselves most conveniently to pictorial representation by enlargement. Further, as many lanternists have small hand cameras, but have not enlarging lanterns, the projection instrument is pre-eminently convenient for them.

Place the Lantern in a Box.—I bought from the grocer's a "cube" sugar-box for twopence, cut a circular aperture in the bottom, and stood the box on one of its sides. The bottom with the aperture is now turned to the front, and the open top appears at the rear. The right and left sides have portions cut out as shown in fig. 44, and these portions are provided with hinges and catches as indicated. They now become side doors, are six inches wide, and allow any necessary attention to be given to the negative on the lantern stage. The upper side of the box is also perforated with an oblong opening to allow of the lantern chimney, and an additional board two feet high is nailed to the front of the box to bar any stray light from the chimney reaching the enlarging easel. The side of this board which faces the chimney is painted dead black.

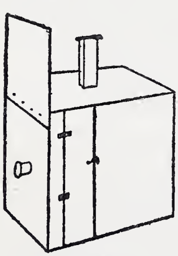


Fig. 44.

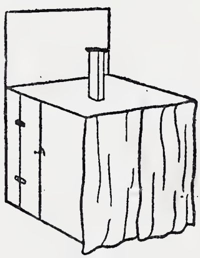


Fig. 45.

The whole box is then covered with thick black woollen material. This keeps both stray light and heat in their proper quarters; no light comes from cracks or fissures in the wood. The cloth is cut to allow the side doors to open easily, and an extra pad is put round the front aperture for an inch or two where the objective protrudes. No light reaches the enlarging easel from a lantern thus protected. I have tested strips of bromide exposed

for several minutes on the easel when the lantern has been at full glare, placing, of course, a lens cap over the objective, but have found no trace of attack by stray light. The paper remained white on immersion in a strong quinol developer.

The back of the box is provided with a curtain (fig. 45) from the same material as that which covers the wood.

A Special Negative Carrier.—The ordinary lantern-slide carrier is applicable only to negatives of $3\frac{1}{4}$ inches in the longer direction. A special carrier must therefore be made.

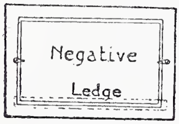


Fig. 46.

This, however, is not a difficult matter. Cut a piece of wood to oblong shape and of a size admissible on the lantern stage. Mark, in its central part, another oblong 4 in. by 3 in., and carefully cut out the middle part with a fret-saw. Take another oblong piece and similarly cut out from its centre an oblong $4\frac{3}{8}$ in. by $3\frac{3}{8}$ in. to permit of the free placing of the negative. Now screw or glue the two pieces together, fix a screw-keeper or turn-button on each side and a brass or wooden ledge at the base to prevent the negative slipping out. The carrier is now complete (fig. 46).

Sundry Lantern Notes.

WHAT nine men out of ten want to know is, "What materials *must* I have?" I soon found out in my own work that one single thing left out of the routine might imperil the success of a lecture. At every lecture given I noticed at each stage of the proceedings, if any item was wanting or could be introduced with advantage; I then jotted down the name of the article in my note-book. Thus by comparing the notes of a number of lectures I was able to compile a useful and comprehensive list of necessities. This I printed in bold type and affixed a copy to the inner side of my lantern-box lid. Here is the list (for limelight):—

STAITHES

Fig. 12 (p. 62). J. J. Rutherford.

Fig. 13 (p. 63). A. Gordon Smith.

Winter's Mirror.

Lantern with tray, jets and chimney.
Slides in box with pads and division card.
Limes—two, in sealed tube.
Slide carrier and wedge.
Lens cap to cover objective.
Rat-tail file to accommodate lime-bore.
Cylinder of gas (oxygen) in box.
Cylinder fittings.
Key to cylinder.
India-rubber tubing (examine for cracks).
Small hammer and screw-eyes.
String and pocket knife.
Matches.
Bell. or other signal.
Reading lamp and candle.
Lecture.
Screen.
Hymn Slides (if necessary).

The Lantern need not be Costly.—It is a profound mistake to imagine that a lantern must be very expensive to be useful. The crux of the business does not lie in the lamp, but in the user and his methods. I have worked many lanterns of various makes, shapes and sizes, and found very little difference in projecting power in any of them when carefully operated. The guinea single lantern is a capable instrument in capable hands. For the travelling lecturer, a small lantern is a *sine quâ non.* He must have a small lantern which is portable and capable of being put into a small box.

The Oil Lamp.—Do not use one—if you can avoid it. But the reader may be so situated that he has no alternative. As I am quite certain that this journal has a place in the quiet country village as well as in the large city, a few hints may be acceptable. First of all, then, keep your lamp clean. Owing to the natural laws of adhesion and cohesion the oil will travel to places where you never intended. It will creep all over the inside of the lantern; it will turn corners and cover the outside as well, so that between the intervals of your using the lamp you may find your apparatus all smeared with oil. When you light up again this surface oil will be evaporated and the room filled with evil-smelling oil-vapour, much to the annoyance of your audience. Clean the lantern and lamp well with rough towelling. Then put in your lamp-reservoir a supply of the best paraffin oil you can get, filling the reservoir to about one inch from the top. Above all things do not allow the oil to run over. Close up your reservoir tightly and trim your wicks with a sharp pair of scissors which will make a clean cut. A wick with a jagged edge is a nuisance, and you will discover it soon after beginning the lecture. In trimming the wick let each side be

somewhat lower than the central part; this gives a relatively larger flame with minimum smoke. If you trim the wick straight the sides will emit pinnacles of smoke before you have turned the light up to its full capacity. Light the wicks and let them burn 15 minutes before turning up to the full, so as to allow the condenser to be heated gradually.

An Oil-lamp Stand.—You want the picture well above the people's heads. The base of the picture must be about 6 feet from the floor and if you have a 12-feet screen, the top of the picture will, therefore, be 18 feet above the floor. Then the centres of your condenser and objective must be directly opposite to a point 12 feet from the floor. Clearly, therefore, you must either tilt the lantern or raise it to a level 12 feet from the floor and place it in a horizontal position. Now, *tilting* with an oil lantern is decidedly risky and often impossible. More condensers have been fractured with this tilting than most operators imagine. The tremendous heat from four wicks fed vigorously by an indraught of air is concentrated on the upper front part of the lantern, and as the glass of the condenser will not expand in the direct ratio of its metallic enclosure, it must succumb. To guard against fracture, the condenser should be equally heated. Here, then, is my plan—tried, tested and not yet found wanting. *Do not tilt at all.* Get a table properly placed equi-distant from the sides of the room; on this a high stool stands and is firmly attached to the table. On this stool is placed a lantern stand, as seen in fig. 47 at A. The illustration will explain itself in a moment. The chair by the table enables the operator to work the lantern wicks comfortably, another chair on the further side will enable him to change the slides with equal

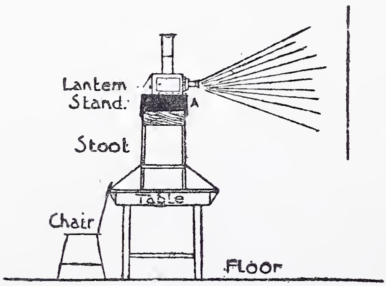


Fig. 47.

grace. Do not use tripods. They are liable to be upset and to contribute to deplorable accidents.

The Limelight and the Limes.—Use limelight whenever possible. It is clean, clear, strong and telling. No smell, no smoke and—when properly managed—no noise. Neither oil nor acetylene is so generally convenient.

The principal mistakes here are made in operating the limes. Personally, I prefer hard limes, conveniently bought in sealed glass tubes. Limes are more or less hygroscopic and, therefore absorb moisture from the atmosphere. In breaking the sealed tube wrap it in a piece of cloth or paper and tap it gently with a pocket knife. By this means you will break the glass without damaging the lime. Bore the lime axis, if necessary, so as to ensure its easy movement on the lime spindle, and in turning the lime during a lecture the operator should do this slowly so as not to throw the screen into occasional semi-darkness. With care there need be no changing of limes during a lecture; if this is a necessity, it indicates some want of forethought on the operator's part; a good, hard lime will last two hours at least.

Jets and Tubing.—A jet cannot work well when clogged. Clean it well before lighting with a small dry brush. Do not probe the nozzle with pins. Bristles will easily remove any obstructions and do no damage. Light the jet 10 minutes before lecture time and give the lime an opportunity of being gradually heated, otherwise the lime will crack. Then turn up the light and note the disc on the screen. If the disc has a dark edge all round, the jet must be drawn in or out a little till the dark edge disappears; if the disc has a dark edge on one side only, the jet must be turned slightly to the right or left to remove it. By this slight manœuvring a clear, uniform disc is obtained. Then fix the jet firmly by the thumb-screws at that point. It will need no more alteration during the evening.

Tubing should be examined for "cracks" before use. The cracks may be perforations; if so, gas will leak and vitiate the air of the room. Red tubing is best and should be perfect from end to

end. At one end it will generally be attached to an ordinary gas-bracket in the room; the nearer this bracket the better; less tubing is then required. Sometimes, however, these brackets are very inconveniently situated; have therefore a good length of available tubing for emergencies. Where a central star gas-pendant is more easily accessible we may use it thus. Suppose it to have 6 jets and we, of course, want only one. Cut 5 small pieces from the tubing, each one inch long, and fit these on to 5 of the 6 jets. Cut a black-lead pencil into 5 pieces and use these as plugs for the 5 small tubes. We have now the gas coming through one jet only. Fasten the tubing to the gas-pipe and to the lantern-jet with strong banding to avoid dislocation. It is awkward to have the oxygen-tube blown off during a lecture. If we must use a long piece of tubing it must be suspended well above the heads of the audience so as not to impede their view.

The Care of the Cylinders.—I have seen them tested under strenuous conditions, filled with gas and thrown on to solid stone without doing or suffering injury. Makers are most careful in their manufacture and test them at a considerably higher pressure than their nominal capacity. Still cylinders call for reasonable treatment. They are now covered with thick bags to minimize risks of concussion; but even yet there is some misgiving on the part of many people as to sitting near them. To overcome this difficulty a joiner made to my specification a pretty little box nicely painted and polished, a really attractive bit of lantern furniture. The lid and one side are perforated to allow of the tubes and fittings. This box is the snug home of my cylinder. Nobody is ever alarmed at it; it is often admired and few seem to know what it contains. It is square in section and sufficiently long to enclose a 10 feet cylinder, the lid being at one end.

Manipulation of the Screen.—A "12-feet" is a convenient size and more easily managed than larger squares. Let a plentiful supply of rings be stitched on each side. I do not, as a rule, find a frame necessary when I have a supply of good

screw-eyes (picture-frame screws). Without a frame proceed thus : Examine the situation where the screen is to be erected. Place two strong screw-eyes in opposite beams; attach the *top* screen-corner rings by cords to these ; you have now fixed the two top corners. Now turn to the floor and insert two more screw-eyes; attach to these the *bottom* screen-corner rings. The four corners are now fixed. Now as to creases. Pass cords from corner to corner through *all* the screen-rings. This reduces the creases. Attach a cord to the middle ring in each side and fasten it to a screw-eye in the floor. This brings the centre quite taut, and the creasing is practically obliterated. Do not wet the screen. Have the lantern in front, not behind.

Placing the Slides.—Have the slides in *one* box with a pad of loose paper at either end. Slides should be spotted on *both* top-front corners—looking at the film-side of the lantern-plate. If they are not spotted I put triangles of adhesive tape (fig. 48) on each corner. These can be seen plainly enough and may carry the number of the slide clearly marked in black ink. Now place the slide with spots uppermost, and all facing in the same direction, in the box and with them a piece of card $3\frac{1}{4}$ inches by $4\frac{1}{2}$ inches—a post-card will do. Remove the pad from one end of the box to allow easy movement of the slides. This card is to be a moving guide to the slide-placer. He puts the card before No. 1. When he has shown No. 1 slide, he places it *before* the card and takes out No. 2 from *behind* the card; when he has shown No. 2 he places it, as in the case of No. 1, *before* the card and takes No. 3, and so on. J.H.C.

Fig. 48.

NOTE.—The *diameter* of the condenser must not be less than the *diagonal* of the slide or negative.

The Optical Lantern, Generally Considered.

By W. H. GLASER and H. GLASER.

THE best way to learn how to manipulate an optical lantern is to assist a skilled operator to get ready and work his lantern for illustrating a public lecture, for which perhaps it is necessary to project at one stage of the proceedings slides, at another transparent apparatus and show experiments, and at another time opaque objects, such as working models or live animals. Dexterity can only be acquired and resource developed by practice, but progress is greatly accelerated by a firm grasp of principles and by a knowledge of the function and mode of action of the several parts of the lantern and its accessories. The writers believe that the information which follows will enable anyone having access to a lantern to become proficient in its manipulation in the shortest possible time. The article opens with a brief description of a typical lantern. The salient parts are enumerated and their functions explained. Then follow in order sections dealing respectively with the principles of projection, a good method of finding the focal length of objectives and similar lenses, formulæ for making and examples of useful calculations required in lantern work, sources of light, screens, and means of communication. Finally, the knowledge thus set forth, together with a few practical wrinkles, is applied in a section which shows how to set up and manipulate a lantern.

A Typical Lantern. A description of a typical lantern will serve to make clear the salient parts of any other lantern and their functions. Such an instrument is the "Universal Projection" or "Demonstrator's" lantern. Its salient parts are: (1) an objective, A, fig. 49, which is a compound convex lens for projecting an image of the object on to the screen; (2) a condenser, B, which is also a compound convex lens, to direct as large an amount

SNOWDROPS

Fig. 14 (p. 63). Dan Dunlop.

of light as possible on to the object, and to light it up uniformly; (3) a source of light, C, preferably an injector jet limelight or an arc lamp: these parts are arranged in the relative positions shown in fig. 49, care being taken to have the axes of the objective and condenser coincident and the centre of the spot of light forming the source on the axial line, for reasons explained below (see section on the Principles of Projection); (4) a stage, D, to accommodate the object; (5) a body, E, to keep the parts in their proper positions and to cut off stray light. The body is fitted with ventilators, inspection glasses, and two doors and a curtain for closing the hand-holes which have to be provided to allow of manipulation. The condenser and source of light are carried by the body; the other parts are held by the framework as shown.

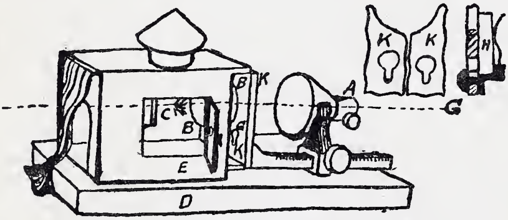


Fig. 49.—Diagram of Typical Lantern.

If the object to be projected be a slide, a carrier stage, F, is attached to the lantern by the neat contrivance marked G, in order to hold in a suitable position the frame of a slide carrier, H. The carrier itself is constructed so as to render the operations of inserting, setting for projection, withdrawing and changing a slide quick and easy to perform.

With some objects and in some experiments it is necessary to have the light coming vertically from below. To meet such cases the lantern body is made with a false front, K, hinged along its top edge so that it can be moved into the horizontal position shown in fig. 50. The false front is supported in its horizontal position by means of a flat mirror, L, which fits into place at an angle of 45° to the false front, as shown in the figure. The lantern as a whole is, of course, set up so that the

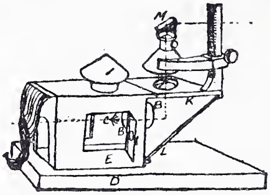


Fig. 50.—Typical Lantern.

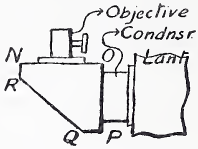


Fig. 51.—Aphengescope.

axis of the condenser is horizontal and the axis of the objective vertical. Finally, an erecting prism, M, is screwed on to the front of the objective with its hypotenuse parallel to the plane of the mirror, L, and with its other faces in horizontal and vertical planes respectively, as shown in fig. 50.

For projecting opaque objects, such as live animals and working models, so as to show them in their natural colours and in perspective, a contrivance known as an aphengescope is employed in conjunction with the lantern. A convenient form of aphengescope is that shown in plan in fig. 51. NOPQR is a five-sided box with a base, but without a lid. The angles N, O and P are right angles. Each of the angles Q and R measures 135°. The object to be projected is placed close to the side, QR, of the box connecting the apices of these angles. The side OP fits up against the front of the lantern, and is cut away where necessary to allow the light to pass through from the condenser. The adjacent side, ON, is provided with a flange to take the objective. The holes for the condenser and objective are situated so that the object may be well illuminated and give a bright image. When the aphengescope is to be used, the objective is removed from the lantern and fitted into the aphengescope instead. The body of the lantern is then turned through a right angle about a vertical axis and the aphengescope fitted to its front. Fig. 51 shows the aphengescope in position. The aphengescope rests on the stage of the lantern, D, fig. 49.

The side QR is removable for greater convenience in projecting some objects, and the aphengescope is often removed altogether, the objective being then supported independently and stray light cut off with a curtain.

The aphengescope needs a very powerful source of light (see section on Sources of Light below), unless only quite a small disc is wanted on the screen, say a disc not more than 6 feet in diameter. Again, for all but flat objects a long-focus lens gives better perspective than a short-focus one, but requires a more powerful source of light.

The Principles of Projection. If we place a luminous object behind a lantern objective or camera lens, provided we do not place it too near, we find a real image exists in front of the lens. For example, in fig. 52 O is a luminous object, L such a lens and I the real image.

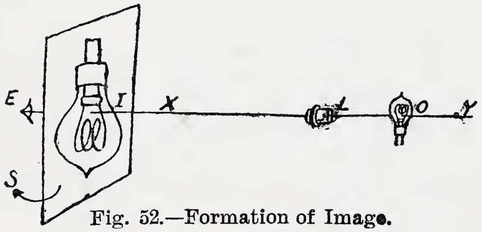


Fig. 52.—Formation of Image.

An observer whose eye was situated in the direction of E would see the image floating, so to speak, in the air at I; but for the observations which concern us now it is more convenient to receive the image on a screen, as shown at S. If we do so receive the image we shall find that corresponding points on object and image respectively lie on straight lines which cross in the lens, that the image is upside down and turned right for left, and that in order to avoid distortion in the image the screen must be flat and perpendicular to the principal axis of the lens. The principal axis of a lens is the axis of revolution, XY, fig. 52. We shall also find that the best images are obtained when the object is on the principal axis, or, in the case of large objects, that the best portion of the image is that on the principal axis, though with many modern lenses this superiority will be hard to detect on account of the high general excellence.

Let us move the object away from the lens, keeping it all the time on the principal axis. As the object is moved away from the lens the image

approaches it (the lens). The more distant the object the more slowly the image approaches, until presently, so far as ordinary observation can detect, it ceases to approach, although the object is taken further and further away. The distance from a point known as the optical centre of the lens to the image in this position is called the focal length of the lens. (It is, however, quite possible to find the focal length of a lens without knowing where the optical centre is; the method is explained in the next section.) The point on the principal axis which the image has now reached is called the principal focus of the lens.

Next, let us bring the object back again towards the lens. As we do so the image retreats and grows larger. When the object is close to the principal focus the image is too far away for us to receive it on the screen. If our object is a small bright spot such as that constituting the source of light in the electric arc, or a first-class limelight, we shall find that the screen is now illuminated by a circular patch of light which is certainly brightest at the centre, but which is very uniformly bright over the greater part of its surface. When the spot of light is at the principal focus the disc of light on the screen is as uniformly bright as it is possible to get it. In this case the image is at an infinite distance from the lens, and is infinitely large.

With a larger source the disc is not so uniformly illuminated.

During these experiments it will have been observed that as the image retreats from the lens it gets less bright. It can be shown both experimentally and theoretically that the brightness depends upon the distance in this way—that if the distance be doubled the brightness is reduced to one-fourth; if the distance be reduced to one-third the brightness is increased to nine times the intensity, and so on, the law being that the brightness of the image varies inversely as the square of its distance from the optical centre of the lens. Hence short-focus lenses (objectives) give brighter images than long-focus ones, other conditions being the same, for they do not need to be so far

away from the screen. On the other hand, for reasons explained in the number dealing with lenses, long-focus objectives have the advantage of giving good perspective views of solid objects and good definition all over the screen more easily than short-focus lenses.

Most objects to be projected are not self-luminous, and must be lit up sufficiently brightly to give a visible image. The conditions to be fulfilled by the illuminating apparatus will be easily realised from the experiments described above. It will be remembered that when the spot of light was at the principal focus the screen was illuminated by a very uniformly bright patch of light, however far away the screen was held. If instead of a small spot we had employed a large patch of light, such as the glowing mantle of an incandescent burner, or if the spot of light had not been on the principal axis, we should have found that the patch of light on the screen constituting the "image" would have been less uniformly illuminated. It is, therefore, obvious that we should select as our source of light a small bright spot, such as that furnished by an arc lamp or a first-class limelight, and that this spot of light should be placed exactly at the principal focus of the condenser, so that the beam of light obtained may illuminate the object as uniformly as possible. The object, too, should be placed so that it is as symmetrical as possible about the principal axis.

Where it is impossible to employ a "spot" source, the best results are most likely to be obtained when a condenser is *not* employed. A piece of thin very finely-ground glass is better than a condenser for getting uniform illumination in such cases, and is, of course, much cheaper as well. It should be fixed as close to the object as possible. This system, however, is very wasteful of light, and when a "spot" source is not available projection work is limited to small scale effects.

To find the Focal Length of a Lens.

One of the simplest and most accurate methods of finding the focal length of a lens, and at the same time one of the easiest to put into practice, when dealing with the lenses

used in the optical lantern and in the camera, is that described immediately below.

First obtain a rough idea of the focal length of the lens by holding it in one hand so as to receive on the other the image of a distant object, such as a bright cloud, a gas-light, arc lamp, etc. The sun gives too hot an image unless screened by light clouds. The distance from the lens to the image on the hand is very roughly the focal length. Next choose a steady table with a plane top, and on it support near one end a flat piece of gauze (wire), G, fig. 53. Take care to set the gauze so

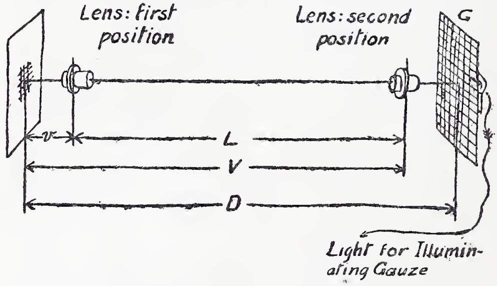


Fig. 53.—Measuring Focal Length of Lens.

that it is in a plane perpendicular to the plane of the table top. Support the lens and a flat screen in line with the gauze, so that the optical axis is at right angles to the plane of the gauze and to that of the screen, and passes through the centre of each, placing the lens between the screen and the gauze. The distance between the screen and the gauze must be not less than four times the rough focal length as found above, and at first the lens should be placed nearer to the screen than to the gauze. The gauze should be brightly illuminated by means of a convenient light placed close to it on the opposite side to that on which the lens is situated.

Move the lens to and fro, keeping the optical axis perpendicular to the screen, until a sharp image is obtained. The apparatus will now be arranged as shown in fig. 53.

Measure the perpendicular distance, D, between the gauze and the screen. Measure also the perpendicular distance, v, from any easily-recognised spot on the lens, say the flange, to the screen.

Fig. 15 (p. 63). W. G Hill

Her homely pleasures glide;
unstained by envy, discontent, and pride.

Fig. 16 (p. 63) E. H. Atkin.

Winter.

Now move the lens towards the gauze, keeping the optical axis perpendicular to the screen, until a second and larger image is obtained in sharp focus. Measure the perpendicular distance from the lens flange, or other selected spot, V, to the screen. The distance, L, through which the lens has been moved, is the difference between V and v. That is, L=V—v, as is obvious in fig. 53.

The numerical value, *f*, of the focal length is given by the formula,

$$f = \frac{(D+L)\ (D-L)}{4\,D}$$

For example, an objective was found to give an image of a distant light on the hand held between 10 and $10\frac{1}{2}$ inches away. The screen was therefore set up at a distance from the gauze which, it could be seen, was greater than $10\frac{1}{2} \times 4$, or 42 inches. After the screen had been set up correctly, as described above, and the first image was in focus thereon, the distance was found to be 52·3 inches, and the distance v 13·8 inches. The lens was then moved towards the gauze until the second image was in sharp focus. The distance V then measured 38·6 inches.

Hence, $D = 52{\cdot}3$ as measured above,

$$L = 38{\cdot}6 - 13{\cdot}8$$
$$= 24{\cdot}8$$

Therefore,

$$f = \frac{77{\cdot}1 \times 27{\cdot}5}{4 \times 52{\cdot}3}$$
$$= 10{\cdot}14$$

The focal length of the objective is, therefore, 10·14 inches.

Formulæ for and Examples of Useful Calculations.

1. To find distance at which to place lantern from screen.

Let v be the distance to be found in feet.

$$\text{Then } v = \frac{f\,(H\text{—}h)}{12\ h}$$

where f = focal length in inches of objective (numerical value).
H = height of image in inches.
h = corresponding height of object in inches.

For example, to find at what distance from the screen to place the objective of the lantern, when the focal length of the objective is 10 inches, the height of the image required is 15 feet or 180 inches, and corresponding height of object is 3 inches (the height of the part of the slide actually projected. In the case of an object other than a slide, the dimensions of the part to be projected would be considered and a proper selection made).

$$\text{We have } v = \frac{10 \times 177}{12 \times 3}$$
$$= 49{\cdot}2 \text{ feet.}$$

The distance from the screen, therefore, at which the objective must be placed is 49·2 feet.

2. To find focal length of the objective which would give an image of a required size, with the lantern at a definite distance from the screen.

Using the same notation as above, the formula is

$$f = \frac{12\ v\ h}{H - h}$$

For example, to find the focal length of the objective which would give an image 12 feet, or 144 inches high, with the objective 30 feet from the screen, we have

$$f = \frac{12 \times 30 \times 3}{141}$$
$$= 7{\cdot}7 \text{ inches.}$$

3. To find height of image given by an objective at a given distance from the screen.

With the same notation as before, the formula is

$$H = \frac{h\ (12\ v + f)}{12\, f}$$

For example, to find the height of the image of a slide given by an objective of 6 inches focal length placed 20 feet from the screen, we have

$$H = \frac{3\ (12 \times 20 + 6)}{12 \times 6} = \frac{3 \times 246}{12 \times 6}$$
$$= 10{\cdot}2 \text{ feet.}$$

4. To find the number of cubic feet of gas remaining in a cylinder of known capacity, from the reading of the pressure gauge.

The formula is $Q = \dfrac{C\,P}{180}$ cubic feet,

where Q is the number of cubic feet of gas remaining in the cylinder.

C is the capacity in cubic feet of the cylinder, and P is the reading of the pressure gauge in atmospheres.

For example, to find the number of cubic feet of gas in a 40-foot cylinder when the gauge reading is 50 atmospheres.

$$\text{We have } Q = \frac{40 \times 50}{180}$$
$$= 11{\cdot}1 \text{ cubic feet.}$$

5. To find the number of Board of Trade Units of electricity which will be consumed during an exhibition.

The formula is $U = \dfrac{VAT}{1000}$

where V = voltage of supply;
A = ampères taken by lamp;
and T = time in hours.

For example, to find the number of Board of Trade Units of electricity which will be consumed during a two hours' exhibition by a lamp taking 12 ampères, the voltage of supply being 230.

$$\text{We have} \quad U = \frac{230 \times 12 \times 2}{1000}$$
$$= 5{\cdot}5 \text{ units.}$$

Sources of Light.

The sources of light which have the greatest claims to the preference of the operator are the electric arc and the injector jet limelight. Other good sources are the mixed jet and the blow-through jet limelights. Saturators are dangerous, except when handled by, or under the direction of, an expert.

The electric arc lamp is made in several forms for projection work, but in all of them the source of light is the small crater which is formed at the tip of the positive carbon. (We are dealing here with direct current. Alternating current is con-

sidered below.) This crater, in accordance with the principles of projection already set forth, should be kept at the principal focus of the condenser. The method of correctly placing the source, and of keeping it at the principal focus, is described in the section on lantern manipulation below.

To assist the formation of a good crater the positive carbon is made with a core of softer material, which is removed by the action of the arc more rapidly than the harder body-case of the carbon. As, moreover, the positive carbon wears away more quickly as regards mass of material than the negative carbon, it is usually made of greater diameter, so that the same length of each carbon may be consumed per hour. This is done to simplify the feeding mechanism.

The crater, of course, is turned towards the negative carbon. In order, therefore, to get the maximum quantity of light delivered to the condenser, the carbons are arranged, not in line with one another, but with the tip of the negative carbon slightly in front of that of the positive one, and with the positive carbon inclined backwards from the condenser in a vertical plane. Fig. 54 shows a typical arc light crater at the focus of a condenser.

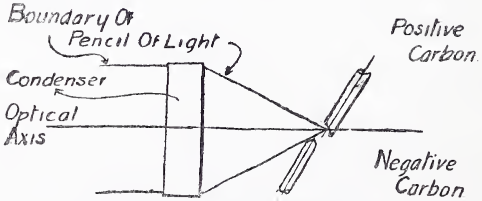


Fig. 54.—Typical Current Crater.

To form the arc the carbons, after they have been properly connected to the supply mains, are momentarily brought into contact at their tips, and then separated so that the tips are from $\frac{1}{4}$ to $\frac{1}{2}$ inch apart, the distance depending upon the size of the carbons, the voltage and ampèrage of supply. The correct distance is that which gives the most powerful light which is sufficiently steady, and is very easily found in practice. Remember to keep the crater at the principal focus by turning the

feeding screw every few minutes and the adjusting screws when necessary. An arc lamp is no more troublesome in this or in any other respect than a limelight.

The essential points in the design of any arc lamp are:—

1. The carbons should be held so that their tips can always be arranged in the relative positions just described.

2. The carbon holders should be capable of taking any sizes of carbons within the ranges required, and should have V-shaped grips or an equivalent device, so that when a fresh carbon, perhaps of a new size, is inserted, no change takes place in the direction of the axis of the carbon.

3. The adjustments provided should make it possible to (*a*) move the whole arc (*i.e.*, both carbons together) up and down, to and fro, and from side to side; (*b*) lengthen and shorten the arc without moving the crater away from the focus; and (*c*) restrike the arc without altering any of the other adjustments. It is needless to add that the insulation should be first-class, and that all "live" working joints should be "bonded." (A "live" joint is one that is in metallic connection with a part through which electricity is flowing, or is ready to flow. A joint is said to be "bonded" when a path for the electricity from one of the parts A to the other B is provided, which is independent of the contact of their working surfaces, so that the current could flow from A to B even if the joint were broken.)

The brightness and candle-power of the light depend upon the number of ampères taken by the lamp. Authorities differ as to the candle-power of a lamp taking, say, 10 ampères, but all are agreed that a 10-ampère lamp is more powerful than any standard limelight. The writers have made no measurements, but, judging from the effects on the screen, consider that an arc lamp taking 7 ampères is of about the same power as a normal injector jet limelight. The difficulty in making measurements of the candle-power of arc lamps and of limelights lies in the hue of the light.

Generally speaking, it is necessary to use a resistance with an arc lamp, and the resistance must be suitable for the ampèrage of the lamp and the voltage of the supply. That is to say, the resistance must be constructed of wire of sufficiently large gauge to carry the full current safely, and must have an electrical resistance of a sufficient number of ohms to give the proper voltage between the terminals of the lamp. The proper voltage to allow between the terminals depends to some extent on the construction of the lamp (whether hand- or automatic-feed, for instance), but 50 volts is a safe standard for our present purpose.

In ordering a resistance for a given lamp and supply, we specify first that it must be capable of carrying the full ampèrage safely for any length of time; secondly, that it must have an electrical resistance of a certain number of ohms, the number being arrived at in a manner which will be clear from the following example:—

Suppose the lamp is to take 10 ampères, and that the voltage of the supply is 230 volts. We subtract from the voltage of supply, 230, our standard lamp-voltage, 50, and obtain the number 180. We then divide this number, 180, by the number of ampères taken by our lamp, 10. The quotient, 18 in the present case, is the number of ohms normally required in circuit with our lamp. We therefore specify that the resistance must be capable of being adjusted to any value within a range extending from 10 per cent. below to 10 per cent. above the value thus found, in order to be able to allow for variations in the conditions of supply and consumption. In the present case the resistance would be specified as to be capable of being adjusted to any value between 16 and 20 ohms. If the resistance is to work sometimes at one ampèrage and sometimes at another, say from 5 to 15 ampères, we specify that the resistance must be capable of safely carrying the highest ampèrage, 15, and be adjustable over a range extending from 10 per cent. below the lowest resistance normally required (*i.e.*, that which would be used for the highest ampèrage) to 10 per cent. above the highest. Taking the voltage of supply as before as 230, the

Fig. 17 (p. 64). H. H. House.

The Narcissus.

range in the above case would be that extending from 10 to 40 ohms. Instead of having the resistance adjustable to any value within the range, it is sufficient, and with some patterns of resistance cheaper, to have it adjustable to several intermediate values only. In such cases the resistance may be adjustable to increase by 10 per cent. increments. The resistance just calculated would, for example, be adjustable to 10, 11, 12, 13·2, 14·5, 16, 16·5, 18, 20, 22, 24, 26·5, 29, 32, 35, 38·5, and 40 ohms respectively. The range from 10 to 40 ohms is unusually great, and when such a range is required it is generally more convenient to have two separate resistances, the one ranging from 10 to 20 ohms, and the other from 20 to 40 ohms.

An excellent temporary resistance, capable of carrying very heavy currents and of adjustment within wide limits of resistance, can be quickly rigged up in the following manner:—Take an earthenware vessel of about the size and shape shown in fig. 55, and fill it two-thirds full with clean cold water. Select four springy pieces of wood or metal of about the same length as the diameter of the vessel, and bind between each pair several carbons using wire, as shown in the figure, taking care to have each carbon in good metallic contact with the wire. Place the rods across the vessel so that the carbons dip well into the water as indicated in the figure, and so that one set of carbons is separated from the other by a distance of five or six inches. Connect up. Add drop by drop to the water some strong sulphuric acid, until the current is great enough. Be patient in adding the acid, or you will overshoot the mark. When the resistance has been in use for a short time the water will commence to boil. The boiling does no harm, but if a heavy

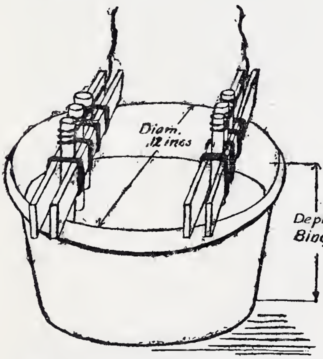


Fig. 55.—A Water Resistance.

current is being employed and the exhibition is a long one it may be necessary to replenish the water; in that case, clean cold water only must be added, as the acid does not evaporate. As the water boils away the resistance becomes less, and that is why it is necessary to add more water, even though the carbons are still sufficiently submerged to make good contact with the water. So keep an eye on the water level. Also take care that the two sets of carbons do not come into contact.

Turning to the consideration of the arc lamp supplied from an alternating circuit, only two modifications require attention.

First.—There is no crater at the tip of either carbon. The tip of each carbon is a source of light. If the carbons are arranged as described above, one of these tips will be hidden, and the other one will be placed in the most favourable position for giving light. It may be objected that this plan wastes half the light, but it must be remembered that since no crater is formed, and since each tip glows all the way round, not more than half the light could in any case be directed towards the condenser, and it is better to have one source of full power at the focus than two sources each of half-power situated one on each side of the focus.

Secondly.—Resistances calculated as above must, for alternating current, be non-inductive. The water resistance just described is non-inductive. Instead of resistances, choking coils can be employed for alternating current, but an adequate treatment of their specification would take us beyond the scope of an article like this one. A competent manufacturer or dealer would supply a suitable choking coil when given particulars of ampèrage, voltage and frequency.

The current, whether alternating or direct, can and ought to be measured with voltmeter and ammeter. Fig. 56 shows how to connect up an electric lantern to the mains. For sizes of carbons to employ, see table at end of section.

In limelights the source of light is a piece of lime (calcium oxide) heated to incandescence by a special flame which is produced by the combustion of hydrogen or coal gas and oxygen. The special

features of the flame are, first, the small dimensions of its cross section, and, secondly, its high temperature. The first of these features is determined once for all when the jet is manufactured, but the second is to a great extent under the control of the operator. The hotter the flame, the brighter the light given by the lime.

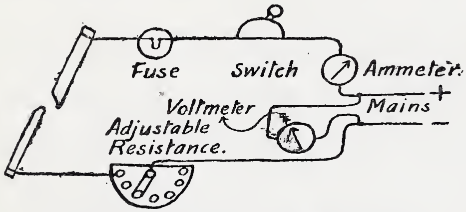


Fig. 56.—Connections for Arc Lamp.

To learn how to get the best results from a limelight jet, remove the lime, close the oxygen tap and turn on a good supply of coal gas or hydrogen. Light the issuing gas, and then turn on the oxygen slowly and uniformly. A cone-shaped flame will be formed, whose general appearance is shown in fig. 57. Notice that there are two cones, an outer one, AB, and an inner one, AC. Chemical theory

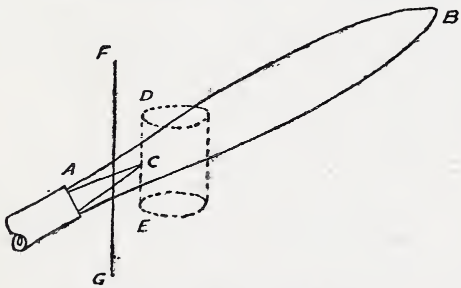


Fig. 57.—Typical Flame Cone.

would lead us to suppose, and experience teaches us, that the hottest region of the flame is that in the immediate vicinity of the tip, C, of the inner cone. Accordingly, the lime should now be placed in the position indicated by the dotted cylinder, DE, so that the tip, C, just reaches the surface of the lime. Examine the appearance of the heated

surface of the lime either with the aid of dark glass or by looking at the reflection-image in the condenser. Push the lime steadily forward until a dark spot appears in the centre of the bright region. The dark spot shows that the lime is too far forward and is cutting the inner cone in the manner indicated by the line, FG, in fig. 57. Now withdraw the lime until the dark spot just disappears.

Finally, adjust the supplies of the two gases to get the best light. The principle to go upon is that the temperature at the tip, C, is higher as the rate of consumption of gas there is greater. In practice the simplest plan is to turn on the full amount of coal gas or hydrogen to commence with (in the case of an injector or blow-through jet; for procedure with mixed jets, see below), and then turn on oxygen until the flame begins to hiss. Adjust position of lime, as described above, and then diminish supply of coal gas or hydrogen until the brightness of the light begins to diminish. An excess of coal gas or hydrogen is merely wasteful, but an excess of oxygen is not only wasteful, but cools the lime, and therefore diminishes the brightness of the light by its blast-like effect.

With mixed jets the same principle, of course, is the one to go upon, but to carry it into effect we have to rely on somewhat different indications. As in the case of injector and blow-through jets, commence by lighting the coal gas or hydrogen only. Turn on only a limited supply. Then begin to feed the flame very slowly with oxygen. If the feeding is too rapid or too jerky there will be a sharp, but harmless, explosion which will blow out the flame. We suppose the lime has been temporarily removed for our first attempt at regulating the flame. Watch the inner cone, AC. Turn on the oxygen cautiously until the flame begins to hiss, then increase the coal-gas or hydrogen supply a little more. Continue this alternating process step by step. Notice that each time the oxygen supply is increased the cone shortens, and that each time the coal-gas or hydrogen supply is increased the cone can be lengthened before it begins to hiss. The hottest flame is that which has the longest

(inner) cone at the same time that it is consuming oxygen at the most rapid rate without hissing. When the flame has been adjusted in this manner the lime can be put into its correct position by means of the indications of the dark spot, as described above.

As a matter of fact, when the flame is properly adjusted a better light can be got from a hissing mixed gas flame than from a quiet one; but the hissing is usually an objection, and the operator needs experience to get the best results with regard to light and economy of gas.

When once the flame has been properly adjusted in the manner just described, its appearance and behaviour should be carefully noted, so that the flame can be adjusted next time without first removing the lime, as this is often an inconvenient operation with mixed jets.

In lighting up any limelight always warm the lime by turning it round and round in the coal-gas or hydrogen flame before admitting the oxygen. Use only the best hard limes, and after the exhibition take the lime off the spindle, and fasten it up in an air-tight tin box with some powdered old limes to keep it free from the attacks of moisture. By taking these precautions a lime may be used several times. If the flame is not properly adjusted the lime will either be pitted or blackened.

With regard to the relative candle-powers of the injector, mixed and blow-through jets, taking good average jets in good average hands, the writers consider that these are expressed by the following numbers: injector, 100; mixed, 110; blow-through, 80; and that the relative candle-power of a seven-ampère direct-current arc and of a ten-ampère alternating arc is 100.

For regulating the pressure of the oxygen a Beard's regulator is the handiest device. It should be adjusted to a pressure of about 15 lbs. per square inch for the injector jet, and to a pressure of about ½-lb. per square inch, or say 12 inches of water, for the blow-through jet. For the mixed jet, where both gases are under pressure, a fine adjustment valve fitted to each supply pipe is a quite good and a cheaper arrangement.

A pressure gauge should always be used with a compressed-gas cylinder; it tells one how much gas is stored in the cylinder (see section on Formulæ and Calculations above), and will enable one to detect even a small leak.

Screens. The best screens are those of the specially prepared opaque variety mounted on rollers. They have a white surface of good grain, and reflect a high percentage of the light which falls upon them.

A calico screen allows about half the light which falls upon it to pass through. This light is lost so far as the purpose of giving a bright image is concerned.

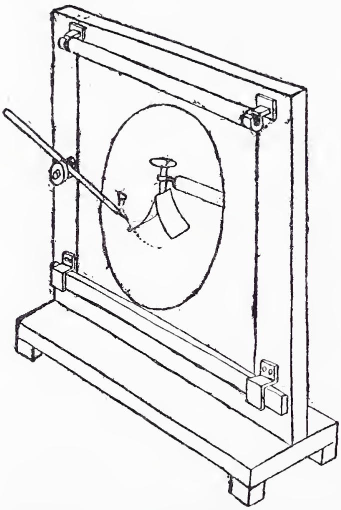


Fig. 58.—Form of Translucent Screen.

In projecting experiments it is often convenient to have the lantern not on the same side of the screen as the audience, but on the other side. For such work a translucent screen with a fine grain is most suitable. Calico does not pass sufficient light to make it serviceable in this connection. Excellent screens can be made from engineers' tracing cloth. Such screens are very translucent, have a fine grain, and are portable and cheap. Finely-ground glass is also a good material, but it is brittle and comparatively heavy and dearer than tracing cloth. It is useful where the slight colouring of the tracing cloth is objectionable. A very convenient translucent screen is that shown in fig. 58. The tracing cloth is attached by one edge to a roller such as is used for spring roller blinds, and by the opposite edge to a straight lath. The remainder of the device needs no explanation, except P, which is a pointer attached to the framework by clamp-

An East-Coast Breaker.

Fig. 18 (p. 64).

E. S. Maples.

Fig. 19 (p. 64). T. L. Hampshire.

Grouse.

screw, and is useful for marking the initial or some selected position of a particular object.

Means of Communication. The best means of communication between lecturer and lanternist is the electric sounder. The sounder consists essentially of an electro magnet with a spring-controlled armature. When the lecturer makes the circuit complete by pressing the pear push, which he holds in his hand, the sounder attracts its armature, thus producing a subdued click. Sounders can be bought, usually at exorbitant prices, or they can be extemporized out of electric bells by rearranging the connections of the bell, so that the two wire ends from the bobbins go direct to the terminals, and by muffling the bell gong. A simple and effective sounder is shown in fig. 59, and could be easily made by an amateur metal-worker, with the exception, in the case of some workers, of the piece of drilled clock spring, which could, however, be bought from the nearest clockmaker ready drilled for a few pence. The spring is easy enough to drill when it has been softened; it is the rehardening and tempering which is difficult.

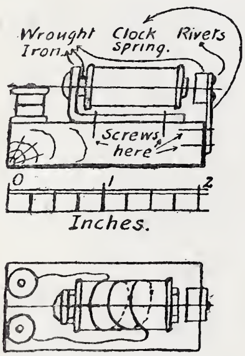


Fig. 59.—Sounder.

It is worth while to have the whole of the wire from the push to the sounder of the flexible variety, because it is then so easy to lay down. The wire should be carefully fastened to its support wherever it is exposed to the public.

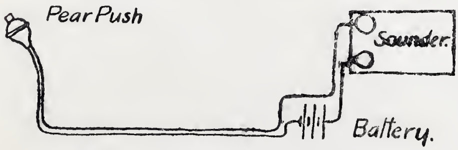


Fig. 60.—Connections for Sounder.

Three of the smallest cells of any of the well-known kind of dry battery will work the sounder satisfactorily. Fig. 60 shows how to make the connections.

Another means of communication is the special glass and shutter fitted for the purpose to the

backs of many reading lamps. A light is shown whenever a fresh slide is wanted.

The two systems compare as follows. The sounder can always be used, it allows the lecturer to be anywhere when he makes the signal; it does not necessitate a reading lamp, but it does necessitate a battery, which occasionally has to be renewed. The reading lamp with special glass and shutter can only be used when the lanternist's work is sufficiently light to allow him time to keep a constant look-out; the lecturer has to go to the reading lamp whenever he wants to signal; it does not necessitate a battery, but it does necessitate a lamp of some kind, which has to be replenished from time to time. Each means has its special sphere of usefulness, but the sounder can be used whenever the lamp can, except in the case of a few very delicate experiments which are not likely to come within the range of work of the average lanternist.

Mechanical clickers used in the lecturer's hand are annoying to the audience.

In illustrating a lecture, whatever means of communication is employed and whatever agreement is made as to the signals, follow the lecturer, so as to be able to tell from his words and gestures, if possible, when he wants the next slide, for a nervous lecturer will keep the sounder or what not going continuously, and will be greatly disturbed if the slides follow one another too quickly.

How to Set Up and Manipulate a Lantern.

The first thing to do is to settle where to put the screen and to fix it up. Remember to have it high enough for the light to clear the heads and the hats of the audience. Then find how far away to place the lantern. The pedestal on which it stands should be as strong and as steady as possible. A strong table is often available, and if it does not rock and is of suitable dimensions, will serve quite well. Give yourself plenty of table-top room. Try to have a clear path all round the lantern.

Light up. If you are using a limelight read the pressure gauge or gauges to see that there is sufficient gas to last through the exhibition. The

quantities of gases consumed per hour vary with different operators and with different makes of jets, and depend also upon whether the jet is being forced, but average consumptions are:—Oxygen, injector jet, 7 cubic feet; blow-through jet, 5 cubic feet; mixed jet, 6 cubic feet. The mixed jet also consumes about 11 cubic feet of hydrogen per hour, or 7 cubic feet of coal gas.

We deal first with the lantern described at the beginning of this article, and afterwards point out the modifications necessary in the case of a bi-unial lantern.

Tilt the lantern until its optical axis passes through the centre of that part of the screen which is to be used, and adjust the lower or upper edge of the screen, whichever is more convenient, until the screen is perpendicular to the optical axis of the lantern. These adjustments can be judged by the eye. An elevator such as is shown in fig. 61 is very convenient for inclining the lantern.

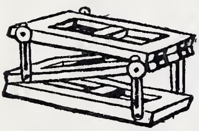


Fig. 61.—Elevator.

To Centre the Light. Draw the tray to the back of the lantern and give the condenser time to become warmed. Wipe off, with a fine handkerchief free from grit, any moisture which is deposited.

Fig. 62.

Fig. 63.

Push the tray in towards the condenser, until a dark ring, such as is shown in fig. 62, appears on the screen. The dark ring indicates that the light is too near the condenser. Draw it back a little, watching the screen. The disc of light will presently resemble one or other of the discs shown in fig. 63. Disc A is produced by a light too high in the lantern; disc B, by one too low; disc C, by one too much to the left; and disc D, by one too much to the right, as seen by the operator when he looks

towards the screen from behind the lantern. Disc E is produced by a correctly centred light.

Setting the Screen.

The next step is to set the screen more accurately perpendicular to the optical axis of the lantern. To do this, put in a slide and focus it so that the image is quite sharp at the top of the screen. Then adjust the bottom edge of the screen until the image is equally sharp there, taking care to keep the whole screen as flat as possible. Sometimes it is more convenient to focus first on the bottom edge and then adjust the top one.

Arrange the communicating device.

If you are illustrating a lecture get hold of the slides as early as you can. Go through them to see they are all turned the proper way round to go into the lantern without delay.

To put a slide into the lantern correctly, face the screen and hold up the slide so that writing, for example, is in the proper position for being read. Then, keeping the same face of the slide towards the screen, turn the slide upside down, and put it in the carrier.

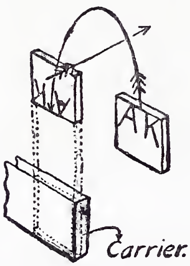


Fig. 64.

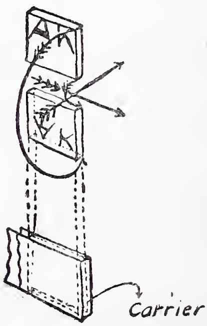


Fig. 65.

The foregoing description only applies to the case when the screen is to be viewed by the audience from the lantern side. When a translucent screen is in use, which the audience views from the opposite side to that on which the lantern stands, face the screen and hold the slide up as before with regard to writing. Then turn the slide upside down so that the face of the slide which was at

first nearer to you is nearer the screen, then put the slide in the carrier. Figs. 64 and 65 show how to rotate the slide in each case, after it has been put in the correct position for reading any writing upon it.

The Bi-unial Lantern. The following modifications are necessary in the case of the bi-unial lantern. The six-way dissolver is connected up as shown in fig. 66. (This matter relating to the bi-unial lantern applies specially to a limelight lantern. With arc lamps dissolving effects have to be obtained without turning the light on and off. (The subject is dealt with below.) Close the oxygen taps on the jets. Turn on the coal gas or hydrogen at the cylinder or supply pipe. Light both jets. Set dissolver handle to feed lower lantern. Turn on the oxygen at the cylinder. Slowly open oxygen tap on lower jet; adjust flame and heat up lime as described in the section on Limelight Jets above.

Dissolve on to upper lantern, and bring its jet into the same condition as the lower one.

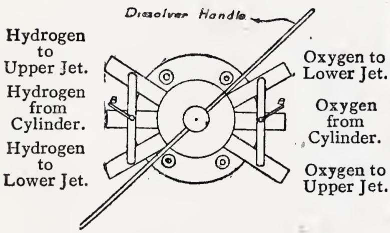


Fig. 66.

Fig. 67.

Now adjust the by-pass taps, if necessary (BB, fig. 66), until neither of the jets goes completely out when the other is turned on by the dissolver handle.

Centre both jets and adjust the screen as described above.

To get the discs to coincide on the screen put in the cross slides. These are simply two opaque slides, each having a transparent Maltese cross marked upon it, as shown in fig. 67.

One of the arms is vertical and the other horizontal when the slide is in the carrier. Turn the dissolver handle to feed both lanterns, so that each lantern projects a cross upon the screen. By means of the adjusting screws bring the crosses centre to centre. Then, if necessary, adjust one or both carriers so as to rotate the crosses until they coincide.

Before adjusting the carriers to bring the crosses into coincidence make certain that the carriers are properly "down" on their stages or holders.

Table showing Sizes of Carbons suitable for given Current.

Current taken by Lamp.	Diameter of Cored Carbon.		Diameter of Solid Carbon.		Diameter of Carbons for Alternating Current.	
Ampères.	Mm.	Ins.	Mm.	Ins.	Mm.	Ins.
5	13	0·51	7	0·28	9	0·35
6 to 7	16	0·63	9	0·35	10	0·39
8 to 10	18	0·71	11	0·43	11	0·43
11 to 15	20	0·79	12	0·47	12	0·47
20	26	1·02	18	0·71	13	0·51

NOTE.—These sizes need not be rigidly adhered to, but it is better to have the carbons too large than too small, because when the carbon is too small in diameter it becomes red hot for some distance from the tip, and the carbon burns away too rapidly, and also heats the mechanism which holds it, to a prejudicial degree.

Fig. 20 (p. 64). F. C. Stimson.

Bishop Alcock's Chapel, Ely.

Hints for Lantern Lecturers.

By A. TRAMP.

SEE that the slides are in order before they are handed to the lanternist.

Open the slide box and put it in front of a fire for half-an-hour before the show begins so that the slides may get slightly warm. This will prevent them from "dewing" in the lantern.

Do not begin with any form of apology either for the slides or the lecture. This only puts the audience on the look-out for short-comings. Speak slowly and distinctly and remember that the person at the furthermost end of the room wants to hear and so speak loud enough for him. Do not anticipate by saying "The next slide will show us, etc." Remarks of this kind cause interest to flag.

When signalling for the slide to be changed use either a lecturer's silent signal lamp or silent electric arrangement, or arrange with the showman to change the slide when you pass the pointer from one hand to the other, and when you take your handkerchief out of your pocket, let that be a sign that the slide wants focussing sharper, etc. Do not say "next slide, please," or drop the pointer on the ground with a bang.

Use a light bamboo fishing rod as pointer, and on the end fix a small ball or pom-pom. This will be greatly appreciated by those at the further end of the room. A fishing rod point makes a nasty scratching noise when it is rubbed against the sheet.

Enliven your discourse with a little humour; just enough to break the monotony, but too many "jokes" have a depressing effect and look like "trying to be funny."

Do not forget the words of the great American humourist, "Profanity or irreverence is always vulgar and never really funny."

Pictorial Notes.

Fig. 8. "**White Currants.**" O. W. F. Thomas.—July, noon; good light; Iso plate and 15 times screen; *f*/16; exp., 15 min. Bromide enlargement toned with Tyo. Altogether an excellent piece of careful craftsmanship. The subject has been well placed in the picture space and the general effect is unusually pleasing. It is an excellent example of decorative composition.—*Print Criticism Award.*

Fig. 9. "**The Finishing Touches.**" A. Richards.—March; 10-30 a.m.; dull; Iso plate; *f*/11; exp., 15 sec. We are glad to see that our friend the artist has at hand a copy of *The Practical Photographer* for ready reference. The idea of the picture is distinctly original. The only fault we have to find is that there are rather too many objects of interest on the table, and these tend to entice our attention away from the finishing toucher, who of course is the factor of chief importance. The picture might be repeated with this hint in mind.—*Print Criticism Award.*

Fig. 10. "**December in the Woods.**" Arthur Turner.—Dec.; noon; Kodoid plate; and 5 times light filter; stop, *f*/11; exp. 1½ min. Dull light and abundant fog. Many a beginner who fogs his plate in the dark-room thinks this will give an atmospheric fog effect. But let him print such a negative and compare it with the excellent result before us and he may learn a lesson for life. The author is to be congratulated on getting just the right degree of real fog without overdoing it as so many fog pictures generally suggest.—*Champion Competition Certificate.*

Fig. 11. "**A Sister of Mercy.**" Thomas Bryans.—Feb.; noon; Imp. Sp. Rapid plate; *f*/6·8; exp., 20 sec.; Wellington & Ward platino-matt bromide paper. The strength of this picture is largely due to his broad arrangement of light and shade. All the strong lights are grouped together and surrounded by softly modulating darks. The highest lights are just a suspicion too flat, and there is also a little too much space between the top of the head and top of the picture.—*Certificate, Portraiture Competition.*

Fig. 12. "**Staithes.**" J. J. Rutherford.—The author

has most happily caught the rugged old-world air of this Yorkshire coast village which is perhaps chiefly remarkable for the number of painters who visit it, and for the variety and pungency of fishy smells which are gratituously provided to all and sundry. There are one or two rather light and assertive patches among the foreground rock masses which might be subdued with much advantage.—*Champion Competition Certificate.*

Fig. 13. "**Winter's Mirror.**" A. Gordon Smith.—This print is especially helpful and suggestive for two reasons. First, the excellent suggestion of the texture or surface quality of the ice, and secondly, the admirable suggestion of movement of the skater.—*Winter Competition Certificate.*

Fig. 14. "**Snowdrops.**" Dan Dunlop.—Feb.; afternoon; Ilford chromatic plate; *f*/16; exp., 3 min. We have only one little fault to find here, *viz.*, the use of a narrow white band of mount. This we hope to subdue largely, if not entirely, in our reproduction. The student reader may take this bit of work as an excellent example of the acceptable effect of gracefulness of line and decorative grouping. The granulated effect of the background is a happy and helpful contrast to the tender delicacy of these modest harbingers of spring time.—*Print Criticism Award.*

Fig. 15. "**Her homely pleasures glide; unstained by envy, discontent and pride.**" W. G. Hill.—August; good light; afternoon; Iso plate; *f*/8; exp., $\frac{1}{5}$ sec. The somewhat rugged time-worn figure is aptly treated in a bold and vigorous manner. The figure "tells" out strongly against the dark doorway background. The unconsciousness of the model is distinctly attractive and contributes substantially to the general success. A little less pronounced alternation of light and dark of the steps would have been advantageous.—*Fourth Junior Salon Certificate.*

Fig. 16. "**Winter.**" E. H. Atkin.—We have only one suggestion to offer, *viz.*, that the right-hand lower corner is just a little too light towards the margins of the print. Otherwise we have only words of praise for this excellent piece of work. The sky part should be carefully noted.—*Winter Competition, Silver Plaque.*

Fig. 17. **"The Narcissus."** H. Harold House.—March; light from small bay window; *f*/8; exp., 30 sec. This highly creditable picture is a good example of that undefinable something known as decorative quality. Not only is the figure well "placed," but there is a general gracefulness of line which is distinctly attractive. We should like to see the somewhat hard and sharp line of the sitter's right arm and shoulder somewhat merged into the background, and also a little more modulation in the deepest darks generally, and in the right fore-arm especially.

Fig. 18. **"An East Coast Breaker."** E. S. Maples.—Sept., 11 a.m.; Barnet ortho. plate; backed; *f*/16; exp. $\frac{1}{90}$ sec.; single lens. The author may be heartily congratulated upon having avoided the blemish which mars about 99 per cent. of wave and rock pictures of this kind. He has just got an acceptable degree of detail and modelling in the foreground shore and rock masses and yet kept them broad and dark enough to "tell" effectively as rock masses. The suggestion of moving water is also admirable. We regret that the size of our reproduction is not large enough to do full justice to this excellent study.

Fig. 19. **"Grouse."** T. L. Hampshire.—This admirable study shows us a class of subject full of interest but obtaining very little attention. As an arrangement of light and shade we should have preferred the lightest part of the background to have been in the upper rather than the lower part of the composition. But apart from this the work is of an entirely pleasing character.—*Champion Competition Certificate.*

Fig. 20. **"Bishop Alcock's Chapel, Ely."** F. C. Stimson.—Although this particular subject is a well-known and favourite one among architectural workers, that fact does not in any way lessen the excellence of the picture before us. But we think the author has made a mistake in surrounding a subject already strongly characterised by many parallel vertical lines with still more strongly marked lines on the mount (omitted in our reproduction). April; sp. rapid plate; *f*/16; exp., 15 min. —*Architectural Competition, Bronze Plaque.*

Some Lantern Novelties.—Having received from **Messrs. Kodak** an invitation to inspect their Lantern Department, we made a special point of being on the look out for really useful and practical novelties likely to interest our readers. We have only space to touch upon some of these very briefly.

The *Navarre* lantern has a hinged piece in the roof of the lantern body. When this piece is turned back, a lamp, together with its glass chimney, can be directly inserted into the lantern. This is a small but useful feature, as it enables one to act promptly in the case of a broken lamp chimney without any risk of burning or cutting one's fingers with the hot and broken glass.

The *Eringa* lantern has three features of special interest. (1) A quick-acting locking device for securely fixing the lens-carrying portion in any position. (2) A rising and falling platform (screw adjustment) for supporting experimental tank, working model, etc. (3) A simple and effective contrivance for centring the light.

Brunswick Arc Lamp and resistance. This is designed to take the current by simply removing the familiar bulb lamp and putting in its place a connection plug. Can be used for direct or alternating current of 100 to 250 volts. The carbons are fitted with the usual adjustments. This device is of especial interest for those wishing to give a home circle slide display, or use an ordinary room for enlarging in the evening, etc.

Argee Condenser. The new feature here is that the lenses are held by a spring clip which catches the glass here and there only at the margin. This gives good ventilation and allows for expansion by heat, thus reducing risk of fracture.

The *Kodak Lantern Slide Printing Frame* is not a printing frame in the ordinary sense of the word. It consists of a piece of wood against which the negative is held by means of two spring clips. The lantern plate is inserted through a square hole in the back of the flat piece of wood and kept in close contact with the negative by means of spring clips. It is thus an easy matter to print a contact slide from any selected portion of a large negative. This brief note by no means exhausts the list of novel features in connection with lantern matters, but it perhaps may be sufficient to show that a visit to this department will well repay anyone interested in lantern matters.

A good brand of P.O.P.—Some months ago we received from **Messrs. Fox Talbot & Co.** (Clapham Common), a sample of their P.O.P. for trial and report, but have not been able to make our examination until quite recently. We found the two sheets packed face to face, rolled up, and wrapped with thin brown paper and put in an ordinary card tube. Although no special care had been taken by us in storing this paper, yet after some months' interval it remained spotless, without any visible sign of deterioration, and it printed and toned admirably. We can therefore congratulate the makers on the production of a paper which retains its good qualities and for a period of time considerably longer than the ordinary person is likely to keep it, and we feel sure that Talbot P.O.P. has only to be known in order to be appreciated.

From **Messrs. Houghtons** come three very neat little calendars in a quiet soft brown, well calculated to harmonize with the photographic print for which a space is provided. The larger size ($7\frac{1}{4}$ by 5) has an oblong opening $3\frac{1}{8}$ by $2\frac{1}{8}$. The next ($6\frac{1}{2}$ by $4\frac{1}{4}$) has a circular opening $2\frac{1}{8}$ diameter. The smallest ($6\frac{3}{4}$ by 4) has a vertical oval opening 3 by $1\frac{3}{4}$. The embossed designs are different in each case and all in commendably quiet taste. We can heartily commend them to our readers as being sure to prove really acceptable presents for friends. They are just the very things to use as useful valentines. The prices are surprisingly low, *viz.*, 2/3 to 3/0 per dozen.

Some Enlarging Apparatus.—Messrs. Houghtons have submitted for our inspection two very simple, compact and practical forms of enlarging apparatus selling at surprisingly low prices. The *Briton* is in the form of a truncated pyramid. The negative (say $\frac{1}{4}$-plate size) is easily fixed in a holder at the smaller end of the pyramid, and a dry plate or piece of bromide paper, whole-plate size, put into the sliding holder at the other end. The apparatus, which is surprisingly light though made throughout of wood, is now taken out of the dark-room into daylight. No focussing is required. The negative end is pointed towards the sky and the lens uncovered by moving a small push-bar of metal. The apparatus is now taken into the dark-room and the plate or paper developed.

This outfit, *i.e.*, for enlarging from $\frac{1}{4}$ to 1/1-plate (or $3\frac{1}{2} \times 2\frac{1}{2}$ to $\frac{1}{2}$-plate with the same apparatus) together with a supply of bromide paper, metol-quinol developer, and book of instructions only costs 7/6.

The next size of *Briton* enlarges from $\frac{1}{4}$-plate to 12×10. Price 13/6.

The *Klito* is a somewhat similar enlarger at a slightly advanced price. For this extra cost one gets the following advantages. The apparatus divides into two nearly equal parts, so that one part can be packed away inside the larger half, so economising space. The plate or paper holder is provided with a draw-slide so that one need only take this part of the apparatus into the dark-room for changing or developing, etc. The price of the $\frac{1}{4}$ to 1/1-plate Klito enlarging outfit is 15/-. Next to the continual charm of seeing a negative image come out in the developing dish we must put the corresponding fascination of seeing an enlarged positive print develop out. Those who have not done any enlarging have not yet tasted more than half the pleasures of photography. And with such cheap and excellent apparatus available it behoves one and all to "taste and try" without further delay.

An Offer. The photographers' perpetual cry to the plate maker is "Give us Speed." Messrs. Elliott (Barnet) have replied in a practical manner by issuing their "Red Seal" plate of speed 350 H. & D., and Messrs. Elliott have generously offered to let photographers have a free sample for trial by writing to the firm and mentioning *The Practical Photographer*. Note the address: **Messrs. Elliott & Sons, Barnet, Herts.**

The Scotch Salon, Hon. Sec., W. F. Hill, 18, Meadowside, Dundee, are incorporating with the forthcoming Salon the novelty of a Photographic Art Union Drawing.

Picture Post-Cards, and How to Make Them, is the title of The Kodak Handbook, Series No. 2, Price 1d., which has just reached us from **Messrs. Kodak.** This little booklet of 12 pages explains in a simple and entirely practical manner the whole procedure of producing some quite charming little pictures on solio (matt or glossy). An ingenious printing frame is illustrated by an excellent diagram, and its use fully explained for the purpose of printing any portion of a negative on any desired part of the card, thus giving unlimited scope for personal taste and skill. For one shilling we may obtain eight negative vignettes, masks and discs, or for half that sum we may have a score plain masks in assorted sizes. With such an inexpensive outfit it is not easy to imagine a case arising that could not be adequately dealt with. We strongly recommend our readers to send a stamped and addressed wrapper and a penny stamp for a copy of this excellent pamphlet.

From **Messrs. Houghtons, Ltd.** (88, High Holborn) we have received a sample package of "greeting" post-cards. The whole of the back is coated with first-rate P.O.P. emulsion, so that we may make a $5\frac{1}{2}$ by $3\frac{1}{2}$ picture or any size smaller, as we please. The package contains two printing masks, one having a $3\frac{1}{4}$ oval opening, the other a $2\frac{1}{2}$ oblong with rounded corners. The greeting designs, two patterns, occupy a portion of the front, leaving ample room for the sender to add his signature, and of course the usual space for the address. The package of 12 cards only costs sixpence. For those who prefer printing by artificial light the cards may be obtained coated with gaslight printing emulsion. In this case the price is ninepence per packet of 12 cards and 2 masks. As everybody nowadays uses photographic printing post-cards, one need not say anything about the assured popularity of the "Holborn" P.O.P. and Gaslight post-cards.

Some Hints on Enlarging is the title of a little booklet just received from **Messrs. Houghtons.** It puts the matter of enlarging in a simple and yet quite practical way, just telling the beginner the things he is most likely wanting to know, without alarming or bewildering him with too much instruction. With this pamphlet at hand and some simple form of enlarging apparatus, the beginner might get along quite well without any further instruction—at any rate until he is emboldened to attempt the more formidable problems of enlarging.

Out of Print Numbers. In reply to numerous querists, we can now only suggest advertising for second-hand copies of the out-of-print numbers.

Prints for Criticism, etc.

Will competitors and others please kindly note our rule to the effect that when prints are to be returned stamp must be sent **WITH THE PRINTS**—*not afterwards?*

Will contributors to our various competitions kindly refrain from sending under one cover prints for different competitions? This not only gives us considerable trouble, but involves the risk of the various pictures not being properly entered for the competition for which they are intended. It is far better for all concerned to send each lot of prints in separate parcels.

Will competitors also please bear in mind that the prints received during the month cannot be judged till the last day of the month, and that as we go to press about the 20th of the month it is not possible to criticise prints in our issue dated the month next to that when the prints were sent in?

E. J. B. (Wisbeach).—Three excellent prints, all quite above average quality. 1. A good sky, but yet it does not seem to harmonise quite satisfactorily with the foreground part of the subject. The landscape is just a little monotonous, *i.e.*, wants a trifle more light and shade contrasts, or perhaps we should say that it wants the shadows slightly emphasising to accord with the strong light and shade effect suggested by the sky. 2. Sky part should be slightly toned down. Another time when your foreground is calm water (this sounds rather Dublinesque!) try the effect of lowering your tripod so as to make the water-foreground occupy less picture space. This is not the same thing at all as cutting off a strip. Nevertheless in the case of your print No. 2, we do think you would improve matters by cutting away $\frac{7}{8}$ inch from lower edge. 3. A good technical result. Pictorially, its chief failing is that you have crowded rather too much subject matter into the picture space. One of the great things to bear in mind when dealing with interiors is the concentration of interest in some one part of the composition.

M. I. C. M. (Kirkby Stephen).—In both 1 and 3 your skies are too dark too sombre, so that prints do not give one a satisfactory impression of sunny weather, but 1 is decidedly better than 3. Both prints suggest over-exposed negatives. A three-times screen is seldom enough for outdoor effect. In our own practice we generally use a ten-times screen for foreground landscape subjects such as you have dealt with. Pictorially, 3 is the better composition. 2. Not at all a graceful arrangement. The three horses are too much "all-in-a-row," at about equal distances apart, and in very similar attitudes as regards the view point from the camera. The man and cart behind and beyond the two front horses make confusion. Technically a very fair result, though rather inclined to hardness.

C. B. (Lancaster).—All three decidedly good, and yet not one of them just quite all that we could wish. 1. This is the most pleasing of the three. Speaking generally one may say that it is very seldom satisfactory to make a photographic (*i.e.*, monochrome) picture where the nearest part ("foreground") in calm water. This seems to weaken the edges of the picture. But in some cases we have no choice, therefore we must compromise or compensate by darkening somewhat the lower corners of the picture so as to keep the eye away from the margins and well within the picture. Your sky and cloud part, though excellent in form, is just a little too dark for the best suggestion of atmosphere. All the land part is quite excellent. We think you would get a better general effect by removing $\frac{5}{8}$ inch from lower margin. 2. Here your chief fault is in overdoing the contrasts of light and shade. The water is in certain places much too suggestive of white paper, and the tree trunks are *very* dark indeed. The fact is your negative has been both under-exposed and over-developed, but the general arrangement is good. 3. This is somewhat weak and featureless, and the sky an obvious blank. Now this is just one of those cases where one ought to ask oneself the question (before making the exposure) "Am I quite clear and sure in my mind what my object is in taking this? Do I know precisely the effect I want to produce in the print?" and until one can answer these questions clearly and definitely it will be best to leave the plate unexposed.

H. S. P. (Bradshaw).—Sorry for your bad news. Hope next report will be "convalescent." Somehow or other a shiny print seems to take all the poetry and imagination out of the picture. It gives us too much, too many details. These are certainly ahead of your previous figure studies. All things considered, we prefer the two knitters. Their apparent unconsciousness of the camera gives an air of reality and freshness which cannot be easily got with posed or conscious figures. We should like to see prints on a moderately rough surface paper. Technically these prints show a decided advance.

J. H. S. (Burmantofts).—1. Whenever possible it is desirable to avoid subjects showing buildings out of the perpendicular. Of course, such subjects do exist, but we unconsciously come to regard them as abnormalities, and so to be avoided from the pictorial standpoint. This print wants some rather severe trimming, *e.g.*, left side $1\frac{1}{8}$, right side $1\frac{1}{2}$, bottom $1\frac{1}{2}$. 2. You might double the pictorial value of this by spotting out on the print that terrible staring figure at the top of the steps, and also considerably subduing the strong lights of the window panes, see back of print. Figures staring at the camera in such a scene as this are just fatal. 3. What a pity that the line of the telescope is just in a line with the horizon. The sky and water are excellent. The old man's position is appropriate, but you made a great mistake in having your lens so high above ground level.

F. D. (Weston-super-Mare).—1. This is very nearly being quite successful as an impressionistic effect, but the face is just a little bit too fuzzy and the child's frock and sea beyond too nearly the same tone. Read up carefully our retouching number and then try a minimum retouching on the face, and by careful masking and local printing get a little more difference between the frock and sea. Tone down the sky part just a trifle; let the pinafore be the highest note. 2. This is rather a muddle, and is not likely to yield anything very satisfactory. 3. The fault here seems to be that you have overdone the developing, and so got too strong density contrasts, giving in turn a print too black and white. You would probably get a softer and better result by quick printing in the sun and developing at a temperature of about 130°F.

A. G. M. (Sunderland).—Neglecting to put your name on back of prints has given us considerable trouble. Please be careful about this in future. 1. A good arrangement, but faulty in light and shade. The chief fault is that your high-lights are too light and chalky, especially those on the water and rocks in right-hand lower corner. Sky requires sunning down. 2. This is very nearly being a great success, and even now is worth trying to put right. Remove $\frac{3}{4}$-inch from right-hand side. Give a little more space at left side and top if you can. Sun down the sky a little. (See *The Practical Photographer*, Nos. 24 and 25). Get the lower margin a shade darker than the adjacent parts. Aim at getting a little more suggestion of gradation in the highest lights. 3. This print is evidently not doing full justice to the possibilities of the negative. The blossom is nearly right but a trifle too papery in the high-lights. A shiny vase was a grave mistake. Your print is not quite bright and vigorous enough.

E. J. L. G. (Clifton).—1. This print does not seem to be doing full justice to the negative. The printing has been uneven, or the negative is stained in some way. The clouds, though excellent in form and arrangement, are yet too low in tone for such a very light foreground, and that is also unevenly lighted. The trees also are too dark and silhouette-like. 2. A *good* sky, but the trees are again too dark, flat and suggestive of the cut-out effect of scenery. This print suggests a negative that has been over-developed (as indeed most othochromatic plates are). The figure is too central and not happily placed; the roadway too conspicuous and liney. 3. A bold and brave try at a difficult subject. The contrasts are still rather too strong to be pleasing. Your best plan is to make a contact positive of moderate density and good gradation (use a slow landscape plate and metol without quinol). Then from this make a new negative of much less density contrast, again using metol without quinol. By using a rough surface printing paper you would get the shadows not quite so solid looking.

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A	48	assorted colours	**A0**	32
A1	48	grosvenor green	**A01**	32
A2	48	duffel gray	**A02**	32
A3	48	gray bark	**A03**	32
A4	48	playfield cream	**A04**	32
A5	48	rough white	**A05**	32
A6	48	dove	**A06**	32
A7	48	deep sea blue	**A07**	32
A8	48	autumn brown	**A08**	32
A9	48	smoke gray	**A09**	32
A10	48	fern green	**A010**	32
A11	48	coffee	**A011**	32
A12	48	wine red	**A012**	32
A13	48	black	**A013**	32
A14	48	olive green	**A014**	32
A15	48	iron gray	**A015**	32
A16	48	russet	**A016**	32
A17	48	slate	**A017**	32
A18	48	drab	**A018**	32
A19	48	brown	**A019**	32

To take sizes up to ½-plate.

Ordinary Thickness. No.	Contains sheets 10 × 8 in.		Extra Thick Series. No.	Contains sheets 10 × 8 in.
B	36	assorted colours	**B0**	24
B1	36	grosvenor green	**B01**	24
B2	36	duffel gray	**B02**	24
B3	36	gray bark	**B03**	24
B4	36	playfield cream	**B04**	24
B5	36	rough white	**B05**	24
B6	36	dove	**B06**	24
B7	36	deep sea blue	**B07**	24
B8	36	autumn brown	**B08**	24
B9	36	smoke gray	**B09**	24
B10	36	fern green	**B010**	24
B11	36	coffee	**B011**	24
B12	36	wine red	**B012**	24
B13	36	black	**B013**	24
B14	36	olive green	**B014**	24
B15	36	iron gray	**B015**	24
B16	36	russet	**B016**	24
B17	36	slate	**B017**	24
B18	36	drab	**B018**	24
B19	36	brown	**B019**	24

To take sizes up to 1/1-plate.

Ordinary Thickness. No.	Contains sheets 12 × 10 in.		Extra Thick Series. No.	Contains sheets 12 × 10 in.
C	24	assorted colours	**C0**	16
C1	24	grosvenor green	**C01**	16
C2	24	duffel gray	**C02**	16
C3	24	gray bark	**C03**	16
C4	24	playfield cream	**C04**	16
C5	24	rough white	**C05**	16
C6	24	dove	**C06**	16
C7	24	deep sea blue	**C07**	16
C8	24	autumn brown	**C08**	16
C9	24	smoke gray	**C09**	16
C10	24	fern green	**C010**	16
C11	24	coffee	**C011**	16
C12	24	wine red	**C012**	16
C13	24	black	**C013**	16
C14	24	olive green	**C014**	16
C15	24	iron gray	**C015**	16
C16	24	russet	**C016**	16
C17	24	slate	**C017**	16
C18	24	drab	**C018**	16
C19	24	brown	**C019**	16

The Ordinary Papers are also supplied in large sheets (28 × 26 in.), price **2/6** per quire.
The Extra Thick Papers are also supplied in large sheets (28 × 26 in.), at **3/6** per quire of 24 sheets.

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or of PERCY LUND, HUMPHRIES & CO., LTD., Bradford, London and Manchester.

O. W. F. T. (Coalville).—A very interesting pair of prints of the same subject. Doubtless you have noticed that the vertical plate arrangement gives one more the suggestion of loftiness, while the horizontal way of the plate give us more the feeling of width. 1 is rather too chalky in the high-lights. 2 is better in this respect. 1 is the more suitable composition and trimming, 2 the better style of mounting. Print and mount like 2, but trim like 1, and at the same time aim at softening down the over-strong light in the right-hand lower corner in 1.

J. P. (Halifax).—1. Title does not seem very appropriate, at any rate they do not look as if they were angling. Avoid small boys with white collars, as the collar nearly always makes a nasty spot of light. Print is rather rough at present, *i.e.*, wants a lot of spotting and quieting down. As a rule reflections are disturbing. You may advantageously remove $2\frac{3}{4}$ inches from the bottom. 2. A somewhat formidable subject to attempt. This would be enormously improved by simply graduating the sky down from above downways, being careful not to overdo it, and as the mask might be in contact with the paper this should present no difficulty (see *The Practical Photographer*, 24, 25). 3. Technically excellent, more particularly the blossom part, but the arrangement of the whole is very stiff and formal, and too symmetrical (see our Floral number). The colour of the print is also too cold to suit the subject.

J. S. (Brighton).—You are inclined to carry development of your negatives a little too far, hence your prints are all somewhat too hard, contrastful, and chalky in the high-lights. Bear in mind that it is easier and safer to intensify a somewhat thin negative and so bring it up to printing density than it is to reduce one which has been over-developed. Your sea studies are too black and white and hence they lack the true suggestion of moving water. They are too solid looking, and the water is too much like carved marble. In 1 the sky is too dark (over-printed), in 3 the sky is not dark enough.

T. J. D. (Bath).—Snow scenes are very often under-exposed and over-developed. Your prints are examples of both faults. 1 is under-exposed. Bear in mind that you have to expose not only for the snow, but also for the dark tree trunks also, and if in doubt it will be better to slightly over-expose for the snow than seriously under-expose for the dark tree trunks in the near foreground. 2. This you have considerably over-developed. Hence the gradations in the high-lights are lost in the over-density of the negative. By the time a very little light has got through the high-lights, far, far too much light has come through the thinner portions, and hence the print is too black and white, too hard in contrasts. When developing a snow scene do not (as a rule) carry development quite so far as when developing an ordinary summer landscape.

S. W. S. (Leeds).—In reply to your query we certainly do think that a very great deal can be done in the way of cultivating any inborn taste for art. The "born artist" who produces masterpieces without effort, study, or training only exists in the heated imagination of the novelist. Of course, we cannot expect to make a colourist out of one born more or less colour-blind, or make a great musician out of one who can hardly recognise one tune from another. As a matter of fact one very seldom meets people without some sense of the pictorial, but this varies greatly in extent or quantity. Our experience is that A, born with average taste and with a strong desire to learn and patience and perseverance to "stick to it" will in the end beat B, the supposed genius who is too idle or conceited to study.

J. S. (Brixton).—All the lenses on your list may be thoroughly relied upon. You cannot be in better hands.

A. M. H. (Highgate).—As a rule we prefer metol without quinol for negatives intended for use in the enlarging lantern.

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